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SOME NOTES ON OFFICIAL STATISTICS OF SPEECH DISORDERS ENCOUNTERED DURING WORLD WAR I

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Understanding the role of speech correction in the present war involves many things, one of which is familiarity with pertinent historical facts. These facts consist in part of statistics and related data on the speech problems encountered during the last war. The picture presented by these statistics is interesting, and its implications are worthy of note.

I. Speech Defects and Selective Service, 1917-18

In 1917-18, as at present, severely defective speech was considered a handicap to full military service. The instructions sent from Selective Service Headquarters to Local Draft Boards demonstrate this fact and reveal progressive changes in attitude. A good summary of the various rulings is given by Love and Davenport (**11**, 64) who say:

> Physical Examination Standards No. 2 prescribed rejections of disorders of speech on test phrases plus facial tremor; but this was clearly to detect cases of general paralysis. Physical Examination Standards No. 4 required acceptance for registrants with speech defects unless the speech cannot be understood. Physical Examination Standards No. 6 specified the acceptance for special or limited military service of registrants who suffer from stuttering and stammering to a degree disqualifying in successfully following a useful vocation in civil life. It is to be noted, therefore, that only grosser forms of speech defects led to disqualification and, from June, 1918, onward, such defectives were to be accepted for special or limited service.[1]

Love and Davenport include speech in their analysis. In explaining their statistical tables the authors point out that the term "speech, defective" includes the more detailed terms "stuttering, speech defective." The only other cue to the particular speech problems which the category included is the classification of "speech, defective" under "Nervous Diseases." Incidentally, it is interesting that included under diseases of the nervous system are such items as tabes dorsalis, several types of paralysis, epilepsy, neurosis, hysteria, chorea, migraine, tic, enuresis, deaf, deaf and dumb, mute and diseases of the spinal cord.

[1] It is interesting to note the similarity of the latter regulations to those used at present.

Only 2,986 of the approximately 2,754,000 men considered by Love and Davenport were reported as having defective speech. In other words, the ratio was 1.08 per 1000 men—or about 0.1 per cent. More specifically:

> Defective speech was found in a ratio varying from 2.3 to 0.02 per thousand in different States. At the head of the list stand the longer-settled States, such as Maine, Maryland, Kentucky, Virginia, Vermont, and Tennessee. At the bottom of the list stand the more recently settled States like New Mexico, Arizona, Kansas, Oklahoma, Wyoming, Nebraska, and Texas. The middle group of States comprises the larger ones—those containing great cities like Massachusetts, Pennsylvania, and New York. The meaning of this variation in the distribution by States of speech defect is, however, not very clear. In general, the Western States show relatively few developmental defects (**11**, 116).

It is obvious from these figures that many conditions which speech correctionists would classify as defective were ignored. Furthermore, there is the possibility that the discrepancies in the incidences by states were due as much to haphazard variations in the standards applied by Local Boards as to actual differences in distribution. In this connection, it is interesting to note how few speech defects were reported from any single state. Table I illustrates this point by presenting data from a few sample states.

TABLE I. Incidence of Speech Defects Found in Drafted Men, 1917-18, as Revealed by Data from Several States. (From Love and Davenport, p. 117.)

State	Number of Cases	Ratio Per 1000	Remarks
Maine	46	2.32	Highest ratio
New Hampshire	7	0.02	Lowest ratio
New York	255	.99	Most cases
Illinois	172	.96	Typical
Indiana	88	1.23	Midwestern
Michigan	105	1.06	States
Wisconsin	100	1.58	
Total for Nation	2,986	1.08	

During 1917-18 the individual diagnosed as having defective speech was usually rejected. Love and Davenport report that 2,769 of the 2,986 speech defect cases were disposed of in this manner—2,211 being rejected by local boards and the remaining 558 by medical examiners at Army camps (**11**, 425). Additional detail on the disposition of speech defect cases is summarized in Table II and mirrors a slight progressive tendency to relax the rigidity of the speech requirement.

An entirely different category discussed by Love and Davenport was comprised of the men with harelip and cleft palate. The writers say:

> These associated defects . . . were, in the earliest regulations, regarded as a cause for rejection in so far as they are responsible for fissures or perforations of the hard palate and interfere with mastication and

speech. However, in June, 1918, perforations of the hard palate and moderate deformities of the structures of the mouth were ordered conditionally accepted in the remediable group, but irremediable deformities were grounds for unconditional rejection (**11**, 72).

Obviously, the emphasis here was on the structural deformity rather than upon the speech deviation—although the latter was taken into account as one effect of the deformity. In all, 1,466 cases of harelip and cleft palate were included in the group studied by Love and Davenport (**11**, 165-166). The average ratio per 1000 was 0.53. This ratio varied from state to state, the range being from 0.00 to 1.55. Incidentally, the authors subject the data on harelip and cleft palate cases to rather detailed analysis but point out that the results are inconclusive because the data are scanty.

TABLE II. Disposition of Speech Defect Cases Found in Drafted Men, 1917-18. Results Expressed in Ratios Per 1000 Men. (Summarized from Material Given by Love and Davenport, Table V, p. 430.)

Disposition	First Million Draftees	Second Million Draftees	Total
Held for full military service	.03	.08	.05
Held for limited military service	.00	.11	.06
Rejected at camp by medical boards	.10	.48	.28
Rejected by local board	No available data	No available data	.59

The number of hearing defects among 1917-18 drafted men might be mentioned briefly. Love and Davenport (**11**, 117-119) report 2,748 men who were classified as deaf and dumb. The ratio per 1000 was 1.00, and when considered by states it ranged from 0.03 to 1.53. By comparison, 3,363 men were found to be deaf. Here, for the country as a whole, the ratio per 1000 was 1.22. Its range by states was from 0.09 to 2.97. Furthermore, the grand total of defects of the ear and defects of hearing—including complete deafness and deaf mutism—was 21,187 men. The national ratio per 1000 was 7.69. This ratio ranged by states from 1.67 to 15.70.

In summary: information on the incidence of speech defect, cleft palate and harelip, and hearing defect cases found during the 1917-18 draft reveal (1) that a surprisingly low ratio of men were classified as speech defectives, (2) that most of the men so classified were rejected, (3) that almost as many men were reported to be deaf-mutes as were recorded to have defective speech, (4) that the number of cases in the cleft palate and harelip category was almost half the number in the defective speech category, and (5) that the aggregate of hearing cases far exceeded the aggregate of cases of speech defect.

II. Appearance of Speech Defects Among Enlisted Men, 1917-19

During World War I speech defects constituted one of the problems confronting the Medical Department of the Army. However, if one may judge from the scarcity of statistical information, the problem was considered of secondary importance. Nevertheless, the data available give a picture which is worth the speech correctionist's attention.

For one thing, the sick report records of Army hospital units reveal that occasionally defective speech was the basis for hospitalization (**10**). From the data available it is not possible to say exactly what problems were involved although the diagnosis was included under diseases of the nervous system.

The records show that a total of 209 cases were admitted to Army hospitals because of speech defects. Furthermore, as is shown in Table III, the majority of these cases occurred among the soldiers stationed in the United States. Incidentally, the incidence in the colored troops was about twice that in the white troops.

TABLE III. Cases Admitted to Army Hospital Units Under the Diagnosis of Defective Speech. Ratios Given are in Terms of Men Per 1000 Per Annum. (Summarized from *The Medical Department of the United States Army in the World War*, Volume XV, Part 2, Tables 46 and 47.)

	Total for men stationed in the United States		Total for men stationed in Europe		Combined total (including a few with color unspecified, etc.)	
	Number admitted	Ratio	Number admitted	Ratio	Number admitted	Ratio
White	164	.08	17	.01	181	.05
Colored	25	.17	0	.00	25	.08
Total	189	.08	17	.01	209	.05

Most of the cases hospitalized for speech defects were eventually discharged for disability. Some of the details appear in Table IV.

TABLE IV. Cases Hospitalized for Speech Defects and Later Discharged for Disability. Ratios Given are in Terms of Men Per 1000 Per Annum. (Summarized from *The Medical Department of the United States Army in the World War*, Volume XV, Part 2, Tables 50 and 51.)

	Total for men stationed in the United States		Total for men stationed in Europe		Combined total (including a few with color unspecified, etc.)	
	Number discharged	Ratio	Number discharged	Ratio	Number discharged	Ratio
White	123	.06	7	.01	132	.04
Colored	17	.11	0	.00	17	.06
Total	140	.06	7	.01	150	.04

In the second place, the neuropsychiatric records show 1,343 cases of stammering among the "diagnoses of nervous and mental diseases and defects among commissioned officers, candidates for commission, and enlisted men" (**3**, 160). Stammering was in this instance included as a category under the psychoneuroses—of which a total of 11,443 cases was noted. As can be observed in Table V, the relative incidence of stammering was much greater among Negroes than among Whites. In fact, 31.8 per cent of the negro psychoneurotics were classified as stammerers and only 9.6 per cent of the white psychoneurotics were so categorized.

TABLE V. Psychoneuroses Discovered in Army Personnel, 1917-18. Stammering was Considered as One Type of Psychoneurosis. (Summarized from *The Medical Department of the United States Army in the World War*, Volume X, Table 6.)

	Total diagnoses of psychoneurosis	Total diagnoses of stammering
White Commissioned officers	166	0
Candidates for commission	124	2
Enlisted men	10,053	991
Total white	10,343	993
Total colored	1,100	350
Grand total	11,443	1,343

Discharge was recommended for 1,021 of the 1,343 cases of stammering mentioned above (**3**, 176-178). This recommendation was carried out in 918 cases. Interestingly enough, only 8 men were recommended returned to full duty and in only 19 instances was treatment suggested. The remaining 295 were approved for limited service. It actually developed, however, that 348 men were retained in service and there is no report on the final disposition of 77 more. Further detail is given in Tables VI and VII.

TABLE VI. Recommendations for Disposition of Stammering Cases Discovered in Army Personnel, 1917-19. (Summarized from *The Medical Department of the United States Army in the World War*, Volume X, Table 12.)

	White	Colored	Total
Discharge	791	230	1,021
Duty	8	0	8
Limited Service	177	118	295
Treatment	17	2	19
Total	993	350	1,343

In summary: The figures given above indicate that during the last war speech derangements constituted a problem of some magnitude. It is also evident (since discharge from service was

by far the most frequent method of disposition) that relatively little speech rehabilitation was attempted by Army agencies. This conclusion is supported by the information concerning the rehabilitation unit known as the Section of Defects of Hearing and Speech—the history of which is reviewed in the pages which follow.

TABLE VII. Disposition of Stammering Cases Discovered in Army Personnel, 1917-19. (Summarized from *The Medical Department of the United States Army in the World War*, Volume X, Table 12.)

	White	Colored	Total
Discharged	701	217	918
Retained	225	123	348
Unreported	67	10	77
Total	993	350	1,343

III. Rehabilitation of Defects of Hearing and Speech, 1918-19

Plans for a Division of Physical Reconstruction—to rehabilitate disabled soldiers—were perfected in 1917 (**2**, 396-400). The Division was under the direction of the Surgeon General of the United States Army. Arrangements were soon completed between the Army and Navy whereby the Division of Physical Reconstruction was also to furnish rehabilitation service to disabled sailors and marines.

The plans for the Division of Physical Reconstruction called for a Section of Defects of Hearing and Speech (**2**, 400 and **6**, 181-182). On March 1, 1918, Col. C. W. Richardson was appointed director of this section. He spent several months completing arrangements and assembling a staff. It was decided that the facilities for rehabilitation of hearing and speech defects were to be housed in General Hospital No. 11, which was the Hospital for Head Surgery. This institution was situated at Cape May, New Jersey. Col. Richardson writes, "On July 23, 1918, we were actually a working section with a fully active unit, consisting of a superintendent, principal, and teachers with seventeen patients for treatment" (**15**, 488). The section remained active until July 7, 1919, at which time General Hospital No. 11 was closed. The hearing and speech patients were then transferred to General Hospital No. 41 at Staten Island (**6**, 188). Therapy was continued at Staten Island for several additional months but eventually ceased. Such, in brief, was the Army's attention to the rehabilitation of hearing and speech disorders induced by World War I.

It is revealing to examine in more detail some aspects in the development and work of the Section of Defects of Hearing and Speech. For one thing, during the preliminary planning period it was anticipated that the war would yield many hearing and

speech casualties. Colonel Richardson estimated, on the basis of figures obtained from England, that approximately 0.5 per cent of all wounded in the A. E. F. would require hearing or speech rehabilitation (**15**, 488). The anticipated scope of the speech problem alone was summarized by Colonel Richardson as follows:

> There will return many soldiers whose defects of speech will result from the injuries and resulting contraction upon the face and air passages. These will require masseurs and teachers especially skilled in reducing contracting, as an aid in the proper restoration of spoken language. As a result of shock injury, many modifications of voice, nontraumatic in character, will be brought under our observation. Under this class we will note the stammerers and other modifications of voice. We will also have many deaf whose control of voice will require restoration. The treatment of returned soldiers afflicted with these disorders will require highly specialized teachers for this work (**12**, 427).

Along the same line, a contemporary bulletin on reconstruction issued by the Office of the Surgeon General of the Army gives a classification of war-induced speech disorders and outlines the plans for rehabilitation which were being developed (**1**, 146-147).

One of Colonel Richardson's first moves after taking charge of the Section of Defects of Hearing and Speech was to prepare a roster of available specialists in speech-reading and speech correction. He discovered 100 speech-reading instructors and 53 "instructors in speech defects" who were willing to serve—under full army regulations—as reconstruction aides (**15**, 488). Obviously, this group could have functioned as the nucleus for an organization capable of meeting demands of considerable magnitude. In this connection, it is interesting that early plans called for the setting up of centers where special teachers could be trained (**6**, 181-182). This eventuality, however, did not materialize.

At its height, the Section of Defects of Hearing and Speech operating at Cape May employed ten speech-reading and three speech correction teachers (**15**, 488). The information on the number of hearing and speech cases treated and the results obtained is a bit confused. Some of the reports available were made while the work was in progress and hence are cumulative only up to the time of reporting.

It is certain that a minimum of 112 patients received speech-reading instruction and at least 54 were given corrective speech training. These cases were treated at Cape May (**15**, 489). In addition, after the work was shifted to Staten Island, "A few cases in which physical restoration had not yet been completed were received from time to time. . ." (**6**, 188).

Data on the types of speech defect encountered are available for only the first 37 of the 54 patients reported by Richardson. The distribution for these 37 cases—which included all speech patients enrolled up to May 31, 1919—was as follows:

Aphasics	14
Imperfect phonation	13
Stammering	3

Aphasic and stuttering	1
Multiple neuritis	1
Aphonia	2
Stuttering	2
Stammering and stuttering	1 (**12**, 444)

Apparently the results obtained in speech-reading were much more satisfactory than were those with the speech defects. The various sources are much more specific in discussing the former. For example, Colonel Richardson says, "The success of our speech-hearing sections can be measured by the following figures: Excellent, 53%; Good, 21%; Average, 14%; Fair, 6%; Poor, 6%" (**15**, 489). No comparable evaluation of the speech therapy is given, although Col. Richardson does report that by May 31, 1919, 12 of the 37 patients receiving speech correction had completed or partially completed the courses outlined for them. The remaining 25 patients were still under treatment (**12**, 443). Elsewhere we are told, "Eleven patients were enrolled in the training for defects of speech—four were discharged cured, two transferred to other hospitals, and five remained" (**6**, 187).

Again, ". . . on November 1 (1919) there were remaining only seven patients with defects of hearing and fourteen with defects of speech, and it was expected that these would complete the course before the end of the year" (**6**, 188). In a 1923 article on twelve laryngeal wound patients treated at Cape May, Berry wrote, "The present vocal results may be roughly classified as: whisper voice, 4; weak hoarse, 5; strong hoarse, 3" (**4**, 102). He specifically lists speech training as part of the treatment given several of these cases. Frazier and Ingham, writing on head wound cases seen at Cape May, say, "Trained teachers gave the (aphasics) . . . daily instruction and exercise in conversation, reading and writing adapted to the needs of the patient and the character of his language disturbance. . . Improvement has been marked in every patient in this group" (**7**, 31). From such bits of evidence, it is hard to determine how great were the results in speech correction. However, in view of the types of defect which predominated and the relatively short training period which circumstances allowed, speech rehabilitation probably was incomplete in most cases. Nevertheless, the indications are that the work was creditably conducted. In fact, Colonel Richardson states, ". . . all the work in connection with speech correction has been a revelation to those who have not previously known its possibilities. It stands out as one of the most remarkable results attained by the Medical Corp in the history of the war" (**12**, 443).

It is hard to determine exactly what functions were performed by the three speech correction aides employed at Cape May. Some hints as to methods used are found in quotations given above. Another hint is given by Ingersoll, who says, "In the cases of injury to the jaw, pharynx and larynx the instruction and vocal

exercises which these teachers gave the patients were exceedingly beneficial in re-establishing the vocal function and stimulating the injured muscles" (**8**, 632). Generalizing, however, all that can be said is that the three speech correction aides dealt with problems as varied as aphasia, laryngeal wound cases, and stuttering. Furthermore, the work demanded by the speech defect cases was not sufficient to keep the correction aides busy. Their services were also used elsewhere. Richardson says:

> We had French, Spanish and other nationalities, with whom I could hardly converse on account of the difficulty of understanding their broken English. These were put on phonetic training, and within a short period, a week or ten days, we not only had them pronouncing English, but also increasing the limits of their vocabulary. The limitation of our work in speech correction is very marked. Of course we have so few come to us in this line (**12**, 435).

More surprisingly, one finds this statement:

> Illiteracy proved a serious impediment to speech-reading work, particularly among the naturalized foreign born and most of the native Negroes. Since there was not enough work for the aides in speech correction, it was decided to give the illiterates an opportunity to remove their handicap (**6**, 185).

IV. Comments and Conclusions

The foregoing discussion has dealt with figures and facts. Its aim has been to assemble and summarize pertinent information from World War I. However, since these data have many implications, a few comments and interpretations should be made in conclusion.

First, the percentage of speech defects among men examined during the 1917-18 draft was surprisingly low in comparison with our estimated population norms as derived from speech surveys. Allowing for the fact that the Selective Service figures include only severe defects, a marked discrepancy still exists. This may indicate that there are fewer speech defectives in the adult male population than is usually thought. A more feasible interpretation, however, is that the speech standards upheld by different draft boards varied and that in general these standards were low. In other words, not all severe speech defectives were kept out of the Army—a conclusion which receives indirect support from figures on speech defects encountered among Army personnel. Furthermore, the importance of these conclusions lies in the probability that the situation is essentially the same today. It is true that a serious effort is being made to keep severe speech defectives out of the Army—although Selective Service is less rigorous on this point now than it was in 1941. Almost every speech correctionist knows of speech defectives who have been inducted. It is safe to assume that at the present time there are a sizeable number of speech defectives who have entered the Army via the draft.

Second, the number of speech and hearing cases treated at Cape May was much smaller than the estimated 0.5 per cent of all wounded. This probably resulted from two factors: (1) speech and hearing casualties were less frequent than anticipated, and (2) only a fraction of the speech cases were sent to General Hospital No. 11. The latter supposition is supported, for example, by the neuropsychiatric statistics. These include over 1,300 cases of stammering, many of which certainly could have been assigned to Cape May. Yet only seven of the first 37 speech cases treated at Cape May evidenced this defect. After examining the available evidence, it seems fair to say that the speech and hearing rehabilitation conducted at General Hospital No. 11 represented little more than a good beginning. It is to be hoped that similar efforts during the present war will be of broader scope and that they will reflect advantage taken of the recent advances in speech rehabilitation techniques.

Lastly, while speech rehabilitation may be accomplished rather rapidly with some types of war casualty (such as certain cases of stammering), the process must be slow and laborious in other instances (such as speech disturbances resulting from wounds). This fact presents difficulties in a situation like the one following the last war, at which time most of the Army's special reconstruction hospitals were operated for a relatively short period. This situation occurred because much of the reconstruction work could be done relatively rapidly. Thus, by 1920 Kammer was able to write, ". . . the cured or reconstructed soldier . . . has disappeared from view. He has gone almost as rapidly as he came—has resumed his position in the ranks of civil pursuit. We see only the wrecks that remain or the cases that have relapsed" (**9**, 689). Under these circumstances—since a speech handicap does not make of a man a "wreck" who must be permanently hospitalized—there probably were reconstructed soldiers who would have benefited from prolonged speech rehabilitation but who were allowed to return to civil life before the latter was completed. In some cases, speech rehabilitation may not even have been begun. Therefore, if the foregoing assumptions are true, it follows that any plans for the rehabilitation of the speech casualties induced by the present war should take into account the varying re-training periods demanded by different types of case. An intelligent program is one which allows for long term, as well as short term, speech re-training facilities.

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Memo—College and university instructors will want to give their students the professional and scientific point of view that is stimulated by a subscription to the *Journal of Speech Disorders—and*

If any of your students or assistants—or former students who are now doing speech correction work—are not members of ASCA, you, as a member, have the professional responsibility of encouraging application for membership by such persons if they are qualified. Address the Secretary-Treasurer, Dr. D. W. Morris, Indiana State Teachers College, Terre Haute, Indiana.

FORMAL CALL FOR PAPERS

American Speech Correction Association

1943 Annual Convention—December 28, 29, 30

COMMODORE HOTEL, NEW YORK CITY

The Program Committee will receive for examination from now until the deadline, August 1, abstracts of papers and addresses proposed for a place on the program of the 1943 meeting of the Association. Three general types of papers will be considered:

1. Technical and scientific papers on speech pathology.
2. Papers dealing with inter-connections between speech correction and related fields.
3. Reports and analyses of speech correction activities connected with the war.

The Committee will operate under the rules set down in the Constitution of the Association:

ARTICLE VI (B)

Section 1. . . . Only members of the Association shall be privileged to submit abstracts for consideration, except by official invitation on recommendation of the Program Committee. No title shall be accepted unless accompanied by a summary of the paper giving the main points to be developed. The summary shall be submitted typewritten in triplicate and ready for printing, shall not exceed one page, and shall contain no tables or drawings. All titles and summaries shall be in the hands of the chairman of the Program Committee on a date to be set by the Program Committee and announced to members of the Association in the annual call for papers. . . .

Section 2. When one or more leaders of the discussion of any particular paper are formally designated, the writer of that paper shall, at least two weeks in advance of the convention at which it is to be read, provide a complete copy of said paper for use of each formal leader. . . .

Section 4. Papers shall be presented in person by the authors unless otherwise authorized by the Council.

All abstracts must be received by the Committee by August 1, 1943. *In addition to summarizing the paper, each abstract must indicate (a) the time required for presentation, (b) details on the type of visual or audio aids which will be needed, and (c) other requirements. The full name and the professional affiliation of the author should be indicated.*

Receipt of an abstract will be taken as evidence that the person submitting it is aware of the following rules governing the conduct of section meetings:

1. All meetings will begin when scheduled.
2. Chairmen will, without exception, hold speakers to time limits on papers, addresses and discussions.
3. As in the past, copies of all papers and addresses are to be collected by chairmen of section meetings, who will submit these manuscripts to the Editor of the *Journal of Speech Disorders.*

The Committee will welcome suggestions from members regarding non-members who can contribute significantly to the program. Such recommendations are to be transmitted to the Committee through a Fellow of the Association.

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SPEECH SOUND ELEMENTS DURING THE FIRST YEAR OF LIFE: A REVIEW OF THE LITERATURE

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INTRODUCTION

The production of speech sound elements beginning with the birth-cry and continuing throughout the first twelve months of life is a phenomenon of interest both to the phonetician and to the psychologist. In spite of the fact that the first study of infant vocalization was published over ninety years ago, and that there are about forty-five references, the data reported in the literature are surprisingly incomplete and uneven in amount. There are several summaries available. Two early ones have become classics, one by Preyer (**33**) and another by Tracy (**38**). The most complete review published in this century is by Lewis (**27**). More recent summaries are those by McCarthy (**28**) and by Irwin (**19**).

A series of evaluative reviews is needed to cover such topics as the production of vowel and consonant elements, the mastery of combinations of elements, the function of babbling, the appearance of word approximations, etc. Such a series would reveal the exact scientific status of the study of infant speech, it would indicate present gaps in the data and it would help in the careful formulation of problems for future research.

The present article makes a beginning in this direction. It does not aim to exhaust the whole gamut of problems in the field, but limits itself to a presentation of past research concerning the status of vowel and consonant production during the first year. It will summarize from the literature such sound elements as occur in the birth-cry, and will make a month-by-month analysis of what is known concerning the mastery of speech sounds by young infants. A second purpose is to evaluate the reports and studies available to the reader at the present time. The review thus is presented in two parts: (I) the data, and (II) a criticism of the data.

These aims encounter certain difficulties in their realization. It will appear that a reviewer is handicapped in identifying with even reasonable certainty the sounds reported by some observers, especially the earlier ones. Not many investigators in this area of research have been trained in phonetics and only a few of them have transcribed the speech sounds of infants by means of the International Phonetic Alphabet. Thus it is now frequently impossible to identify the phonetic nature of some of the data. In this connection it seemed advisable to differentiate in the text

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between those observers who used the phonetic alphabet and those who transcribed in an orthographic system of symbols. The device adopted is to bracket the symbols of the phonetic alphabet as is usually done in printing, but to italicize the letters of the remaining studies.

I. The Data

The Birth-Cry

The birth-cry seems to be an item of interest to the investigator of speech sounds although it is the observation of the present writers that it differs little from cries heard during the first days of life. The following eleven investigators have made notes on the sound elements present during the birth-cry: Hall (**16**) reports that the sound is *a*, Moore (**30**) also says it is *a*. Shinn (**34**) found it to consist of the sounds *ng* and *a*. Major (**29**) gives two sound elements, *a* and *e*, while Stern and Stern (**36**) indicate it to be *aha*. Blanton (**4**) found that the cry carries sounds varying from *a* to *u*. Hoyer and Hoyer (**17**) report the single sound *a*, and Fenton (**12**) likewise notes the single sound *a*. Gesell (**14**) gives *a* and *e*. Lewis (**27**) and Gregoire (**15**) are the only two observers who used the International Phonetic Alphabet in their transcriptions. The former gives the two sounds [ɑ], and [ɛ], the latter [ɑ] and [ə]. Gregoire (**15**) did not distinguish between [ə] and [ʌ] in his study, hence [ə] might actually represent [a] or [ʌ].

It will be noticed from the above tabulation that the frequency of the vowel elements of the birth-cry varies. Five observers report the presence of [ɛ] and of [ɑ], three find [æ], one gives [ʌ] and one [ə]. It should be observed that the translation from the orthographic to the phonetic system made here may not be correct.

Besides the data on the birth-cry, some investigators give the sounds of the "first cry" which may or may not be the birth-cry. Thus, Löbisch (**33**) heard the sound *a*. Champneys (**6**) gives *nga*, Perez (**32**) *a*. Friedemann (**33**) lists *a, e, g, h, ch* and *r*, and Taube (**33**) only *a*. Bean (**3**) heard the two sounds *a* and *u*, and Shirley (**35**) reports *a, u, ng*. Whether the sounds in this list are the first sounds heard or really were the first cries cannot always be determined from the reports.

First Month

The reports in the literature on speech sounds heard during the first month of life cover the time span from 1885 to 1942. Most of the studies are meager observations on an occasional infant. Although systematic work with an adequate sample of children has been done recently in only a few studies, thirteen investigators have reported data for the first month.

Perez (**32**) quoted M. Calle's observation that the sound elements are: *a, i, e, o* and *u*. Garbini and Egger according to O'Shea (**31**) reported that the crying sound during the first few weeks was *a*, and the Sterns (**36**) say that during the first few

days it is *ä* or *ähä*. Blanton (**4**) lists the vowel and consonant sounds during the first thirty days of life: *o* as in *owl*, *e* as in *feel*, *oo* as in *pool*, *a* as in *an* and *a* as in *father*. The consonants are *m*, *n*, *q*, *h*, *w*, *r* and *y* as in *yet*. Hoyer and Hoyer (**17**) give *u*, *a*, *a* and *m*. Fenton (**12**) reports *a* as in *la*, *a* as in *bar*, *oo*, *o*, *h*, *l* and *w*. Bean (**3**) states that crying sounds included *a*, *u*, *w*. Lewis (**27**) heard his son use [a], [u], [e] and (l] during this period. Leopold (**26**) in his study of the vocalization of a bilingual child found [æ], [a] and [ʔ] present. Irwin and Curry (**24**) found that crying during the first ten days included the vowels [æ], [ʌ], [ɛ], [ɪ], [u]. Irwin and Chen (**23**) also observed the sounds of infants during the first ten days and reported the following list in the order of frequency: [æ], [ɛ], [ʌ], [ɪ], [i], [e], [u]. Chen (**7**) in an unpublished study on this period observed the vowels and consonants during crying, whimpering and non-crying. Under these conditions the following speech elements are listed.:

Crying [ɪ], [ɛ], [æ], [ʌ], [ʊ], [l], [h], [ʔ]
Whimpering [i], [ɪ], [e], [ɛ] [æ], [ʌ], [k], [h], [ʔ]
Non-crying [i], [ɪ], [ɛ], [æ], [ʌ], [u], [k], [l], [h], [ʔ], [g]

Second Month

The materials available in the literature on speech sounds during the second month are not as satisfactory as for the first. Observations still are casual and limited to one or two cases. Lewis (**27**) and Leopold (**26**) both transcribed sounds in the International Phonetic Alphabet. A total of fourteen reports are available for this period.

Sigismund (**33**) lists three vowels and six elements: *a*, *e*, *u*, *b*, *g*, *m*, *n*, *p*, *r*. Vierordt, 1891, quoted by Preyer (**33**) suggests that *a* was used to express pleasure, and *ä* to express displeasure. Lindner (in Preyer, **33**) indicates that by the ninth week and perhaps earlier *a*, *ä*, *k*, *n* and *r* are present. Taube (in Preyer, **33**) found *a*, *ä*, *e*, *i*, *o*, *ö*, *u*, *ü*, *g* and *l* in the seventh week. Preyer (**33**) gives *a*, *o*, *ö*, *u*, *g*, *h*, *m*, *r*, *l*. Shinn (**34**) lists one vowel, *a*, during the sixth and seventh weeks, and six consonants: *b*, *g*, *h*, *m*, *n*, and *w*. Stern and Stern (**36**) report the use of *ä*, *e*, *k*, *r*, while Dearborn (**9**) heard the single vowel, *a*, on the fifty-third day. Bateman (**1**) gives *a*, *o*, *b*, *d*, *m*, and in the second report (**2**) *a* (long), *o*, *b*, *m;* Hoyer and Hoyer (**17**) give *a*, *ÿ*, *m*, *r*, and Bean (**3**) *a*, *o* (long), *u* (short) and *h*. Lewis (**27**) notes the presence in this period of only (a) and (g). Leopold (**26**) found six vowels and seven consonants: [ɪ], [æ], [ʌ], [ə], [ɑ], [u], [d], [h], [k], [l], [R], [x], [y].

The above listing of speech sounds for this month reveals great variation among the reports. One author found a single sound. Another reports the presence of twelve elements. Some writers give more vowels than consonants, but many list more consonants than vowels. The most probable explanation of this situation is the inadequacy of sampling.

Third Month

During this month a larger number of speech sound elements are reported in the literature. At least three writers observe ten or more sounds, one of them as many as fifteen. Eight investigators have reported on speech status during this month.

Vierordt, 1881, according to Preyer (**33**), reports that during the third and fourth months the speech elements *a, ä, e, u, b, f, g, h, k, n, m, p, r, s* are present. Strümpell, 1880, (in Preyer, **33**) found that at the tenth week *a* and *h* were uttered. Preyer (**33**) heard the following sounds: *a, ā, ä, e, i, o, ö, u, b, g, h, l, m, n* and *r*. The Sterns (**36**) give *e, h, k*, and Dearborn (**9**) only *o*. Bean (**3**) reported that a blind child in its third month produced four sounds: *a, u, h, m*. Lewis (**27**) transcribed the following sounds: [ɑ], [a], [i], [ɛ], [ə], [u], [ü], [g], [j], [l], [n], [ŋ], [r]; Leopold (**26**) gives [ɛ], [ə], [u], [b], [g], [k], [w], [x].

Fourth Month

Seven studies have been reported for this period, whereas the total for the first month is thirteen. Of these seven, only one used the International Phonetic Alphabet. Only two studies sample more than one or two cases; Shirley (**35**) used twenty-five infants, and Krehbiel (**25**) fifteen.

Vierordt (**33**) reported his data for the third and fourth months together. It is therefore impossible to show which sounds occurred exclusively during the fourth month. We have presented these sounds in the preceding section. Preyer (**33**) gives the following vowels and consonants: *ö, a, ā, ă, ä, e, ă, ū, n, t, h, l, m*. Moore (**30**) presents the sounds heard between the fourth and tenth months without regard for their monthly status. Furthermore, a distinction is made by her between sounds produced during crying and during babbling. Eight sound elements were heard during crying: *ă, ä, â, e, ŭ, ng, d, m*. During babbling, twenty-nine sounds were produced: *a, ä, â, ă, e, ĕ, ē, i, o, ō, ô, oo, u, ū, û, b, d, g, k, m, n, ng, p, r, s, t, th, w, z*.

Bean (**3**) suggests that by the end of the fourth month nineteen sounds are produced. He does not make it clear whether these are elements or combinations. Shirley (**35**) lists seven vowels and four consonants: *u, oo, eu, e, a, i, o, g, h, n, w*. Both Lewis (**27**) and Leopold (**26**) report that no new sounds appeared during the fourth month. Krehbiel (**25**) in an unpublished study on the speech elements of fifteen infants during the second quarter-year of life separated her data into crying and non-crying sounds. She made two transcriptions during each month of the sound elements occurring on thirty respirations of each of fifteen babies. The total number of utterances is approximately 900. These data have been arranged in a tabulation.

	Vowels
Non-crying	[i], [ɪ], [e], [ɛ], [æ], [ʌ], [ə], [ɑ], [ɔ], [ʊ], [u]
Crying	[i], [ɪ], [e], [ɛ], [æ], [ʌ], [ɑ], [ɔ], [ʊ], [u]

Consonants

Non-crying [n], [b], [d], [g], [t], [k], [w], [l], [j], [v], [z], [θ], [h]
Crying [n], [b], [d], [g], [k], [l], [j]

Fifth Month

During the fifth month the literature continues to show great differences in the number of sound elements heard by the various observers. There are ten reports in the literature.

Taine (**37**) found three vowels and three consonants in the speech of his five-month-old daughter: *a, e, u, g, h, r,* while Strümpell, 1880, (in Preyer, **33**) heard only the two consonants, *g* and *r*. Preyer (**33**) reports a larger number of sounds: *a, ā, ă, e, ĕ, i, o, ö, u, g, k,* whereas G. S. Hall (**16**) states that sixty-three variations of sounds are present, forty of them heard during a single morning. The Sterns (**36**) give *a* and *d*, the Hoyers (**17**) only *ä*, but Fenton (**12**) observed the German *ö*, the French *eu*, also *a* and *i*. Of the consonantal sounds she reports *d, p, ch* (German), *gh* (German), *g, ng, th,* and *z*. Shirley (**35**) lists *a, e, o, oo, u, b, d, h, g, j, l, p, r, w*. In contrast, Lewis (**27**) heard a single element [ɛ]. Shirley's sample consisted of twenty-five babies whereas Lewis worked with his son. Krehbiel (**25**) made two transcriptions, during the fifth month, of the sound elements produced by each of fifteen infants. Her analysis shows the following:

Vowels

Non-crying [i], [ɪ], [e], [ɛ], [æ], [ʌ], [ə], [a], [ɔ], [o], [ʊ], [u]
Crying [i], [ɪ], [e], [ɛ], [æ], [ʌ], [ə], [a], [ʊ], [u]

Consonants

Non-crying [m], [n], [b], [p], [d], [g], [k], [w], [l], [j], [z], [f], [θ], [h]
Crying [m], [n], [b], [g], [k], [l], [j]

Sixth Month

The literature for the sixth month reveals that the speech status does not differ much from that of the fifth although fewer reports are found, seven altogether.

Preyer (**33**) lists nine vowels and six consonants: *a, ā, ă, e, i, o, ö, ô, eu* (French), *g, m, h, ch, r, j*. The Hoyers (**17**) note the presence of four consonants: *b, p, g, m*. Gessel (**14**) indicates that a twenty-four-hour observation on a six-months-old child yielded more consonants than vowels. He gives *a, e, u, d, b, ng, r, h, m, w, n, g, t*. Bühler (**5**) found the following sounds: *e, u, b, h, r*. Bean (**3**) gives only *p* and *t*, and Lewis (**27**) [u], [a], [b], [p], [h], [m]. Krehbiel (**25**) has made the most systematic study for this period. Her data include the following speech elements under the conditions of crying and non-crying.

Vowels

Non-crying [i], [ɪ], [e], [ɛ], [æ], [ʌ], [ə], [ɑ], [ɔ], [o], [ʊ], [u]
Crying [i], [ɪ], [e], [ɛ], [æ], [ʌ], [ɑ], [ʊ], [u]

Consonants

Non-crying [m], [n], [b], [d], [g], [t], [k], [w], [l], [j], [θ], [h]
Crying [m], [n], [b], [d], [k], [j], [h]

It is apparent from data found in the literature that infants during the second quarter of the first year of life produce most of the vowel elements and about half of the consonants. When these results are compared with those for the first month, during which about half of the vowel elements and very few consonants are present, it becomes evident that a great expansion in the mastery of sounds has occurred during the first six months.

Seventh Month

Research on speech sound status during the seventh month is exceedingly meager. There are only six reports. Taine (**37**) gives three sounds: *a, t, d.* Preyer (**33**) for this month attempted a rough treatment of the frequency of sounds; *a, ŭ, ĕ, ö, r, m, l* are listed. He then indicates that *b, d, m, n, r,* are produced often, *g* and *h* are infrequent, while *k, p* and *t* are rarely heard. The Sterns (**36**) list eight sounds: *a, ä, u, b, w, p, t, h,* while the Hoyers (**17**) give the single sound *a.* In contrast, Bean (**3**) reports the presence of ten sounds: *a, e, i, o, oo, p, k, g, d, b.* Finally, Leopold (**26**) heard [a], [b], [w], [d] and [g].

Eighth Month

There are eight studies available for this month. Perez (**32**) reporting on the eighth and ninth months suggests that *a* is still preferred, while *h* is used in combination with it "to signify something." In a communication by Friedemann to Preyer (**33**), *a, e, p, d, r* and *t* are listed. Preyer's (**33**) account as usual is the most complete. He observed the presence of eighteen sounds: *a, ā, ă, ĕ, i, ei, au, o, ö, u, ŭ, h, p, r, n, t, m, j.* The Sterns (**36**) give *a, e, r, p, m;* the Hoyers (**17**), *a m, w;* and Fenton (**12**) *o, a, i, oo, ai* and *d.* Foulke and Stinchfield (**13**) made a seven-day record of a case supposedly retarded in speech. Altogether six sounds were heard: *a* (as in *arm*), *a* (as in *at*), *p, b, m, h.* Leopold (**26**) found [a] and [æ], and babbling sounds ranging in that part of the vowel triangle from [a] to [e]. Consonantal sounds are [d], [g], [b], [bw], [ʔ], [h].

Ninth Month

Eight observers have collected data covering the ninth month. According to Preyer (**33**), Sigismund, 1856, found the sounds occurring during the third quarter of the first year to be *ä, u, a, e, b, f, d.* Humphreys (**18**), one of Preyer's correspondents, claims that all initial consonants were distinctly pronounced except *th, t, d, n, l.* Strümpell (**33**), another correspondent of Preyer's, indicates that he observed *a, m* and *p.* Preyer (**33**) himself lists *a, ä, ā, ă, au, ö, u, m, n, r, p, g, ch.* The Sterns (**36**) give *ä, a, e, i, d, p, j, n.* Fenton (**12**) found *a, e, d, t, s, ch.* Lewis (**27**) reports [a], [æ], [ʌ], [ç], [m], [x], [d], and Leopold (**26**) [æ], [ɪ], [ɑ], [d], [r], [R], [ʔ], [b]. He also records the presence of the glottal stop [ʔ].

Tenth Month

Ten studies are found in the literature for this period. Friede-

mann (in Preyer, **33**) gives five sounds for this period: *a, e, d, m, t,* while Taube (**33**) wrote Preyer that *a, ä, p, b* and *m* were heard by him. Preyer's (**33**) record shows fifteen sounds for this month: *a, ä, ā, e, ë, ĕ, ö, n, d, b, l, r, m, p, t.* Shinn (**34**) observing her niece found *a, ă, ĕ, i, o, oo, n, m, b, g, ng, d.* The Hoyers (**17**) continue to note the single sound *a,* Bühler (**5**) gives three sounds, *a, u, w,* and Bean (**3**) gives *a, o, n, t.* Shirley (**35**) reporting for both the tenth and eleventh months finds *a, e, o, oo, u, h, y, d, wh, v, n, b, z, m, p, r.* The best transcriptions are those by Lewis (**27**) and Leopold (**26**). The former includes [æ], [a], [ə], [ɛ], [ʌ], [m], [b], [g], [p], [r], [j], [ŋ]; the latter gives [æ], [ɑ], [ɛ], [ai], [i], [ə], [t], [b], [d], [j], [ŋ], [ç], [k], [m], [ʔ].

Eleventh Month

A total of eleven authors have included materials on the eleventh month. Humphreys (**18**) holds that during this month the child learns to pronounce initial *th, t, d, n, l.* Lindner, 1882, (in Preyer, **33**) found the following sounds during the elventh and twelfth months: *o, ó, a, ä, e, i, u, m, b, t, ch, r, d, w, g, l, k, n, h.* Preyer (**33**) quotes some data from Taube which includes the sounds *a, ä, i, u, d, r, n, g, ch.* Preyer (**33**) heard a total of twenty-four sounds: *a, ă, ā, ä, aa, e, ë, ee, i, o, ö, u, d, n, t, h, g, b, l, k, m, p, r, j.* In contrast the Sterns (**36**) give only *i, a, d;* the Hoyers (**17**) *a, i, d, k, x, t.* Bühler (**5**) heard three elements: *a, u, w.* Fenton (**12**) *a, e, ee, d, j, sh, h, y, s;* Bean (**3**) *th,* and Lewis (**27**) [a], [p], [d]. Another more extended list is that by Leopold (**26**) including [a], [i], [ɪ], [ɛ], [e], [ʌ], [ɑ], [p], [r], [t], [ç], [ʃ], [s], [w], [d], [ʔ], [m]. Of the authors listed, Lindner (**33**), Preyer [**33**] and Leopold (**26**) have observed and recorded the largest number of speech elements, the latter being the only one to use the International Phonetic Alphabet.

Twelfth Month

There are only seven articles in the literature dealing with the last month of the first year. As is true of the literature of each of the preceding months, that covering the speech sound status of the twelfth likewise shows a lack of uniformity in the observations of different authors. The range in the number of elements reported is from two to eighteen, Preyer's (**33**) work again being the most complete. Taine (**37**) noted two vowels and four consonants: *a, u, m, k, r, p.* Friedemann (in Preyer, **33**) gives five vowels and three consonants: *a, ä, e, i, u, p, t, d;* Taube (in Preyer, **33**) gives *a, ä, o, u, d, g, p, r, w, k.* Preyer's (**33**) list is *a, ä, e, i, ö, oo, u, h, j, n, p, d, w, r, l, m, g, k.* The Sterns (**36**) give only *a, p;* the Hoyers (**17**) *a, p, r, t, m,* and Fenton (**12**) *p, r, t, z.*

II. Evaluation of the Data

A cursory reading of the preceding sections makes it quite obvious that a systematic knowledge of speech sound status throughout the first year of life has not yet been achieved. The

work is spotty, meager, and unscientific. The best consecutive account of this period is that by Preyer who observed his own child during the first year and supplemented his data with observations submitted to him by friends and correspondents who in turn had jotted down occasional records made for the most part on the speech of their own children in a quite unsystematic fashion.

One gets a rather vivid impression of the wide variation in number of sound elements produced by babies, according to these authors. For instance the Sterns (**36**) report one vowel and one consonant during the first few days of life, whereas Lewis (**27**) heard at least five sound elements, and Irwin and Chen (**23**) found that during the first ten days about half of the vowel sounds and five consonants were present. In the fifth month the Hoyers (**17**) noted a single sound but Krehbiel (**25**) transcribed thirteen vowels and thirteen consonants. In the eleventh month the Sterns (**36**) list three elements, the Hoyers (**17**) six, Preyer (**33**) twenty-four and Leopold (**26**) seventeen. This is a surprising situation. In order to evaluate it the literature will be discussed under three headings: (1) sampling, (2) method of recording and (3) methods of analysing data.

Sampling

Probably the first report on infant speech sounds was the one made in 1851 by Lobisch (**33**), a physician. Observations were made on one case and most reports since then have confined themselves to one or two cases. Darwin (**8**) studied the speech of his son. Taine (**37**) published a similar account of his daughter's speech. Preyer (**33**) likewise worked with his own child. As late as 1936 Lewis (**27**) studied a single case. The Sterns (**36**) observed the language development of their two daughters, and Leopold (**26**) in 1939 reported on the bilingual development of two cases. More recently some attention has been paid to the necessity of adequate sampling of cases. Blanton (**4**) made some observations on speech sounds of an unspecified but fairly large number of infants during the first month, and Shirley (**35**) kept notes on the language development of twenty-five children during the first two years. Irwin and Curry (**24**) studied the vowel sounds of forty infants under ten days of age and Irwin and Chen (**23**) used eighty-five newborn infants in their study. Krehbiel (**25**) analysed the vowel and consonant status of fifteen babies during the fourth, fifth and sixth months of life. Thus for about ninety years, the problem of scientific sampling of infant speech sounds was neglected. Only recently has the problem been recognized.

The problem of adequate sampling, however, is not exhausted by a treatment of the number of cases observed. It involves also the frequency of observation of a given child during a stated unit of time. Preyer (**33**) observed his child daily for the first eight days, four times during the second month, eight times during the third, three times in the fourth, twice in the fifth and once

each in the remaining months of the year. Nothing is indicated as to the length of time of the observations nor as to the number of sampling records obtained during each observation. Again, the Sterns (**36**) report the birth-cry, and meager observations for nine of the first twelve months. Strümpell (**33**) devotes seven observations from the tenth week to the eleventh month, most of which are concerned with the nature of the sounds. Shinn (**34**) in her biography of a baby noted the birth cry and made observations during the sixth, seventh and eighth weeks. Her next report refers to the tenth month. Gesell (**14**) made a twenty-four-hour record on the speech of a six-months-old child. The Hoyers (**17**), Fenton (**12**), Bean (**3**), Lewis (**27**) and Leopold (**26**) each report on eight to twelve months of the first year. Krehbiel (**25**) sampled the speech sounds of fifteen infants twice during each of the fourth, fifth and sixth months.

There is, however, a further problem. Each sample may be a casual observation consisting of occasional notations, or it may be a methodic record. Much of the work in the past has been of a casual nature. Shirley (**35**) has expressed the difficulty encountered in her own work: "The great drawbacks to the study of speech in infants are the difficulty of stimulating vocal responses and the difficulty of recording them. . . . Whenever vocalization occurred, it was noticed by jotting down "coos," "babbles," "gurgles," "grunts," "sings," or "scolds. . . . " Syllables were spelled out, diacritical marks were added if the speech came within the limitation of the English tongue and the recorder's speed of note-taking (pp. 47-48). McCarthy (**28**) likewise is impressed with the difficulty of transcribing the speech sounds of infants. Most of the work on the first year is characterized by this casual approach.

There are two possible methods available for systematically sampling speech sounds. One is to take a time sample, the other is to take a behavior unit sample, that is, to transcribe the sounds which occur on a given number of respirations. Irwin and Curry (**24**) tried out both methods and found the former to be unreliable. The behavior unit sampling was worked out by them. In their study on forty newborns they observed such sound elements as were uttered during each of twenty-five respirations. This made available 1000 respirations which yielded a total of 1285 elements. Krehbiel (**25**) recorded the sounds on thirty respirations of each of fifteen children twice during each of the fourth, fifth and sixth months. This yielded a total of 2700 respirations. Irwin and Chen (**23**) studied eighty-five babies during the first week of life, transcribing the sounds occurring on thirty breaths for each child. With five infants a sample consisted of 180 respirations each. These last studies have attempted to meet the problem of sampling from the standpoint of securing a sufficient body of data during the course of an observation.

Then there is the matter of sampling children in various social

levels. The method of stratified sampling has been introduced only recently into this area. Irwin and Curry (**24**), Krehbiel (**25**), Irwin and Chen (**23**) and Chen (**7**) have confined their interest to normal babies. Irwin (**20**) has studied the speech sound status of low grade feeble-minded children, and in an unpublished study (**21**) has investigated this problem with orphanage infants. Furthermore, an adequate sampling technique in the study of speech development during the first year will require that similar studies in a number of languages be undertaken.

Methods of Recording

In general there are available two methods of recording speech: (1) observational and (2) mechanical. In the first, transcriptions may either employ orthographic symbols or a specially devised system of symbols such as the International Phonetic Alphabet. The majority of the reports found in the literature of speech during the first year have used an orthographic transcription. Interestingly enough, a number of authors who have published since the invention of the International Phonetic Alphabet did not avail themselves of its use. This is true of Blanton (**4**), Bean (**3**), Shirley (**35**), Hoyer and Hoyer (**17**) and Fenton (**12**). In general most writers make use of diacritical marks and a few include key words. Among those who have furnished key words are Preyer, (**33**), Tracy (**38**) and Blanton (**4**). It must be remembered that Preyer's key words are German words. When key words are included, a difficulty arises due to variation of pronunciation. Shirley (**35**) did not employ in her report either key words or diacritical marks. A further difficulty encountered in reading the literature is due to inconsistency and incompleteness in the use by various writers of diacritical marks. Especially among the older investigators one can not be certain of their use of marks. For these reasons one is frequently at a loss to know accurately the sounds heard by a number of investigators.

Recently a few investigators have transcribed the speech sounds of infants in the International Phonetic Alphabet. It has been employed in the following reports: Lewis (**27**), Gregoire (**15**), Leopold (**26**), Krehbiel (**25**), Irwin and Curry (**24**), Irwin and Chen (**23**), Chen (**7**), Irwin (**20**). The Iowa group of investigators have followed Fairbank's (**10**) usage and have employed a broad rather than a narrow transcription.

In connection with the use of either an orthographic or a phonetic system of symbols there is a very important problem. This concerns the reliability of the trained observer. This problem may be met by the use of two or more observers transcribing the same sounds, the agreement being expressed either as a correlation value or as a percentage. For a period of about ninety years this problem has been largely overlooked by workers on infant speech. Krehbiel (**25**) reported an average percentage of agreement of two observers of 91 on transcription of eleven vowel sounds of five babies during the second quarter-year of life. The

range was from 71 per cent to 100 per cent. On thirteen consonants the percentage of agreement was 94 per cent, the range being from 50 per cent to 100 per cent, with all but two percentages lying above 95. Irwin and Curry (**24**) found that the use of the short time sample technique yielded reliabilities little better than chance and devised the behavior unit method of observing. They found that observing such sounds as are uttered upon a single breath is the least difficult unit with which to work. One of the observers indicates the next respiration to be noted and both observers then transcribe independently such sounds as are uttered.

Irwin and Chen (**23**) have made what is probably the most systematic study of the problem of observer reliability. Since they transcribed sounds under the three conditions of crying, whining and non-crying, a preliminary problem in reliability was the discrimination of crying and whining. Using five infants it was found that these observers could reliably discriminate these two conditions. The percentages of agreement ranged from 95 to 100 with an average of 97 per cent. Working with forty infants they report 93 per cent agreement on a frequency-of-sound criterion, and 91 per cent for a breath criterion. It was further found that training in transcribing sounds of new-born infants will yield reliabilities above 90 per cent after eighteen subjects have been used.

A difficult problem of observation arises from the fact that the production of sounds, especially during crying, proceeds so rapidly as to tax the recorder's ability to transcribe them. In order to solve this problem samples of the consecutive, the alternate, and the fourth sounds uttered were compared as between observers. On a frequency criterion the agreement was 96 per cent, on the breath criterion it was 95 per cent. When comparisons were made among the records of the consecutive, alternate, and fourth sounds, it was found that close similarity existed among them. It is suggested, then, that representative transcriptions may be obtained even if consecutive recording may at times be difficult.

Another general method of recording is by means of mechanical instruments. Fairbanks (**11**) who was interested in the pitch range during the first year has reported some work done with the harmonic analyzer. Recording on phonograph discs is an excellent method, of course, for preserving speech sounds. The obvious advantage is that they may be heard repeatedly. However, it should be pointed out that the problem of reliability of observers in analysing the sounds still remains. As a device for training observers its value has been long established.

Methods of Analysing Data

The traditional procedure in the study of the infant's speech has been to make a record of such sounds as occurred at some time

during the course of the year. The report usually consists of a dated record, without statistical treatment. Many reports do not contain a very large amount of data and there is little possibility of useful analysis. Some records are presented with comments on the nature of the sounds. That is, an interpretation is made by the transcriber as to whether a sound expresses pleasure, displeasure, pain, or hunger, or whether there are "coos," "gurgles," etc., Shirley (**35**). The barnyard theory, according to which some infant sounds resemble those of animals, has been suggested by Blanton (**4**) and by Gesell (**14**). Leopold (**26**) used a chronological method, adding copious comments. Efforts have been made to establish sound sequences. The first was by Lobisch (**33**). Other attempts are by Sigismund (**33**), Schultze (**33**), Preyer (**33**) and Fenton (**12**). Occasionally attention has been paid to the initial, medial and terminal positions of consonants in a pattern of sounds.

Krehbiel (**25**) determined the number of speech sounds used by each child. She was interested also in an analysis of the frequency and the percentage of total frequency with which each element occurred during each month. She also determined the age and sex differences in the production of the sound elements. Irwin and Curry (**24**) studied not only the frequency of production of vowel elements of newborns, but analysed their data into the percentage of frequency of front, middle and back vowels. Irwin (**22**) reported on the use of the profile as a graphic device in presenting speech sound data. Chen (**7**) made a systematic study of the usefulness of a number of ratios for analysing data. Among these are: the vowel ratio, the consonant ratio, the vowel-consonant ratio, the type-token ratio. These workers use a variety of statistical devices for the analysis of large groups of data. The statistical approach has not yet been fully exploited in work on infant speech. It will undoubtedly become increasingly necessary with the accumulation of data.

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EDITORIAL NOTES

Names of the members of the recently appointed Editorial Staff appear on the front cover of this issue of the *Journal*. It is to be noted that the Associate Editors represent the East, South, West and Middle West, and also the medical profession. Moreover, they represent a comprehensive variety of special interests within the speech correction field. The four Assistant Editors, also, contribute considerably to both the geographical and the professional representation embodied in the Editorial Staff.

Following are brief statements concerning each of the members of the Editorial Staff:

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(*Continued on Page* 136)

A PHONOGRAPHIC SCALE FOR THE MEASUREMENT OF DEFECTIVE ARTICULATION

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I. Introduction

The purpose of this study was to investigate the possibility of measuring degree of deficiency in articulation. A rough classification of severity of such disorder as *slight*, *moderate*, or *extreme* may be serviceable for an extensive survey. For clinical and research purposes, however, more objective and refined methods of measurement should find important uses. For example, if it were possible to devise a scale for measuring degrees of misarticulation, this scale would enable experimenters to compare the effectiveness of therapeutic procedures, and would enable clinicians to describe results of corrective procedures in more exact terms.

Several possible approaches to this problem of scale construction were considered by the present writers. It might be possible to describe defective articulation in terms of the physical characteristics of the speech waves. A phonetic analysis of defective articulation might be undertaken for the purpose of assigning weights to the various defects, thereby arriving at a score representing degree of departure from normal speech. Still another possibility would be a carefully devised rating scale using descriptive phrases to identify the various scale positions. The impracticability of the first of these, the complexity of the second, and the subjective and variable basis for the third inclined the authors to favor a "product" scale involving recorded speech samples.[1]

Considerable uncertainty was felt about the practicability of such a phonographic scale. To judge which of two recorded samples represents more normal and intelligible articulation requires a general, over-all judgment in spite of the difficulty that individual A may have a marked lisp whereas individual B may have a defective [l] and [r] and, in addition, be rather indistinct.

[1] Dr. Dorothea McCarthy of the Fordham University Graduate School, Department of Educational Psychology, independently suggested this procedure. In a letter to one of the authors, dated March 13, 1940, she wrote: "Since standards of speech are extremely difficult to describe verbally in such a way that others can identify samples of it, it seems to me that phonograph records giving samples of the speech of each type would best serve . . . in arriving at a useful rating scale. The samples of speech on the phonograph records could be utilized in some such fashion as the handwriting samples are used as a guide in the Thorndike handwriting scale."

II. Procedure

A brief selection which contained all English sounds and most of the difficult consonant blends was prepared.[2] Recordings of this selection as read by children with speech defects were made in the Brooklyn College speech clinic. Eight of the recorded samples, varying from almost wholly unintelligible speech to normal, were selected for experimental use. Judgment of the samples by the method of paired comparison was deemed advisable. Ten adults participated in a preliminary series of comparisons which clearly demonstrated that there would be 100 per cent agreement about pairs which were markedly different and that only by comparison of adjacent samples (as estimated by the experimenters) would there be enough disagreement among judges to permit use of this scaling technique.

III. Results

Following this preliminary test 25 adult observers recorded their judgments as to the better of each adjacent pair of speech samples which were presented in random order. Every pair appeared twice in the series to permit each member of the pair to be presented first in one of the two comparisons. The percentage of the judges who preferred sample 2 to sample 1, 3 to 2, etc. was computed. From these proportions the scale separation of the pairs in terms of sigma was determined from Table E, "Deviates and Ordinates for Areas under the Normal Curve," in *Psychometric Methods* by J. P. Guilford. The result was quite unsatisfactory. There were two gaps in the scale because in two cases there was 100 per cent agreement as to the better of a pair. Moreover, the scale separations of the other samples varied greatly.

To remedy these deficiencies a second experiment was planned. A new series of 10 recorded samples, again varying from nearly inarticulate to fairly normal speech, was prepared. Adjacent samples, as judged by the experimenters, were compared by a group of 78 observers at New York University and by a

[2] The selection used for the recordings was as follows:

About seven o'clock last Saturday, Daddy and Mother and I walked across the bridge to the house of my eleven or twelve year old friend, Ralph Brown. The sky was a very pretty blue as we stepped across the village square and passed the church. On our left was a little stream where we looked for fish, small frogs, and snails. It was early spring so I wore my green sweater suit, brown shoes, and red gloves. But my fingers became cold anyway.

We began climbing a big hill just for pleasure. Father spoke up saying that he had taken lunch for us—three dry crackers from a kitchen drawer, a dish of prunes, cream, milk, and some bread and fig jam. I like these foods.

Mother slipped her golden rings and little silver thimble on a string around her neck. Then she stooped to smell the flowers. She hoped we might see queer birds or a tall zebra from the zoo, or hundreds of bees. I said, "I wish you would buy me either a sled or some boys' skates." Just then we reached Ralph's home.

group of 61 observers at Brooklyn College. As in the first experiment, the order of presentation was such that all observers heard each member of a pair first in one comparison and second in the other. The results for the two orders of presentation were averaged together on the assumption that actual use of such a scale as was contemplated would be by persons thoroughly familiar with all of the samples and, consequently, not much affected by the order of comparison of a given pair. The results of these judgments are shown in Table I. Also shown are the results of a further check on preferences for the pairs 6-7, 7-8, 8-9, and 9-10.

TABLE I. Preferences of Three Groups of Observers for Recorded Samples of Defective Speech Presented in Pairs

Samples	Group A		Group B		Group C		Average	
	Preferred 1st (%)	Preferred 2nd (%)	Preferred 1st (%)	Preferred 2nd (%)	Preferred 1st (%)	Preferred 2nd (%)	Preferred 2nd(%))	No. of judges
1-2	6.5	93.5	6	94			93.75	139
2-3	39.5	60.5	15.5	84.5			72.5	139
3-4	5	95	3.5	96.5			95.75	139
4-5	73.2	26.5	73.5	26.5			26.5	139
5-6	39	61	38.5	61.5			61.25	139
6-7	36	64	6	94	33	67	65.5	131
7-8	11.5	88.5	10	90	9	91	89.25	192
8-9	68	32	43.5	56.5	65	35	33.5	131
9-10	40.5	59.5	67	33	30	70	64.75	131

This check was made because marked discrepancies in results on three of these pairs contrasted sharply with the close agreement on all other pairs and suggested that accidental factors, such as faulty understanding of instructions or unusual listening conditions, might have been responsible. As will be seen from Table I, the original figures obtained from group A are very close to the preferences recorded by group C, the supplementary group of 53 observers. It seemed justifiable, therefore, to average the preferences of A and B recorded for the pairs 1-2, 2-3, 3-4, 4-5, and 5-6; to average the preferences of A and C for pairs 6-7, 8-9, and 9-10; and to use all three groups for comparison of samples 7-8. It is believed that the size of the groups and the degree of agreement between groups A and C make this procedure reasonable, and that this is not a matter of selecting data in line with any preconceived hypothesis.

From the average preferences of these groups ranging from 131 to 192 observers, scale separations of the samples were determined by the method described above and are shown in Table II. It will be seen that the selection of samples 8, 7, 5, 3, 2 and 1 gives a series of fairly well-spaced scale values.

The scale is intended for use in the following manner. The

user must first familiarize himself thoroughly with the recorded samples of defective speech. A speech defective whose quality of articulation is to be rated against the scale samples is then requested to read, or preferably to record, the same selection used for the scale.[3] The speech to be rated is then assigned the scale value of the most similar sample of the scale or, if necessary, a value half-way between two scale steps.[4] A practical test of

TABLE II. Scale Separations and Scale Values of Recorded Samples

Sample	10	9	8	7	6	5	4	3	2	1
X value	.380	.426	1.243	.399	.287	.628	1.728	.598	1.538	0.000
Scale value	5.119	4.739	5.165	3.922	3.523	3.236	3.864	2.136	1.538	0.000
Revised scale value	1.046	1.426	1.000	2.243	2.642	2.929	2.301	4.029	4.627	6.165
Final scale steps			1	2		3		4	5	6

this procedure by the authors, in a New York City elementary school, indicates that the scale may be used with ease and that two examiners agree closely in the scale values assigned to the pupils tested. Similarly, high inter-correlations between judges' ratings were found in a study of the reliability of the scale conducted at the University of Wisconsin by Mr. Asa Berlin, and submitted as a Master's thesis. The judges in his study heard the recorded scale only at the beginning of a series of judgments rather than each time an individual was rated, as recommended above. Systematic reference to the scale steps as a check on the accuracy of the rating, which would otherwise depend on the examiner's memory, should of course result in greater reliability.

IV. Summary

A phonographic scale for measuring defective articulation was constructed running from nearly inarticulate speech to speech judged substantially normal in articulation. Scale steps were computed on the basis of judgments of the recorded samples by groups of observers numbering from 131 to 192 persons.

[3] The reading material used in the final version of the scale was limited to the first paragraph of the complete selection (see footnote 2) because it was found that judgments of the speech samples were almost invariably made after only a few sentences, and comparison of samples was made much easier by use of the shortened selection.

[4] It was intended that duplicate recordings be available for purchase by speech clinicians. Due to war-time conditions, it has been decided to postpone such arrangements. The authors will be glad to hear from those who would order the scale if copies were made available. The entire scale is recorded on one twelve-inch record.

A STUDY OF SOUND DISCRIMINATION ABILITY OF ELEMENTARY SCHOOL PUPILS[1]

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I. Introduction

This study of the sound discrimination ability of elementary school children was conducted with two ends in view. The first purpose was to determine whether there was any variation in the ability of the children to discriminate between identical and unlike syllables when the position of the discriminative element was changed from the initial to the medial or final positions. The second objective was to determine whether a short test of sound discrimination could be used satisfactorily.

II. Procedure and Subjects

In order to determine whether the position of the discriminative element was important, two tests, similar in type to the Travis-Rasmus Test of Sound Discrimination (**2**), were constructed. The two tests, each containing 100 items, were identical except for the position of the consonant element or combination. In the first test, the consonant was in the initial position with the exception of [ŋ] since here the final position is the more familiar. In the second test the discriminative element was in the final position with the exceptions of [ŋ] and the semi-vowels which were in the medial position. Of the 100 items in each test, 32 were the same and 68 were different. As far as practicable nasals, plosives, semi-vowels, fricatives and combinations were included in the tests in the proportion that 103 pre-school children had been found to make errors on these types of sounds in a previous study (**1**). This previous study showed that on the basis of 100 the nasals were missed 8 times, and there are 7 items in each of the tests in which nasal elements are used in both syllables; plosives were missed 11 times, and 12 plosive items are included in each test; semi-vowels were missed 24 times, 20 semi-vowel items are included; fricatives were missed 27 times, 34 fricative items are included; combinations were missed 30 times, and 6 combination items are included. The greatest difference is to be found in the number of the combination items. The combinations [tʃ] and [dʒ] are used twice in the three possible combinations, [tʃ-tʃ], [tʃ-dʒ] and [dʒ-dʒ], with two different vowels. Since it was not considered advisable to use combinations alone any more frequently than this, the remaining twenty-one items are made up of mixed consonant types: 2 semi-vowel and plosive, 5 semi-vowel and fricative, 4 fricative and plosive, and 10 fricative and combination.

[1]Read before the American Speech Correction Association at Chicago, Illinois, Dec., 1942.

These two tests were given to 301 elementary school pupils in grades two to six at the Lincoln School, Wauwatosa, Wisconsin. The second test was given one week after the first. The examiner stood in the center of the room so that the children could not see her lips. Practice items were given so that the test was clearly understood. The children were given forms marked off in squares and, depending upon whether the syllables were heard as the same or different, each child placed an *S* or a *D* in the proper square in response to each stimulus pair.

III. Results

In analyzing the scores made on the two tests we find that on the first test the range of errors for the group is from 2 to 52, and on the second test the range is from 6 to 50. There were 859 more errors made by the same children on the second test than were made on the first test.

TABLE I. Table Showing Average Number of Sound-Discrimination Errors on Test I and Test II for the Separate Grades and the Total Group.

		TEST I		TEST II	
	N.	Errors	Average	Errors	Average
Grade 2	44	664	15.09	711	16.16
Grade 3	45	567	12.60	722	16.04
Grade 4	64	659	10.30	909	14.20
Grade 5	70	625	8.93	838	11.97
Grade 6	78	838	10.74	1030	13.20
Total Group	301	3353	11.14	4210	13.99

When we look at the average number of errors made in each grade, it is interesting to note that there is a gradual decrease in the average number of errors from the second to the fifth grade, although there is a slight increase in the sixth grade in both tests. In each grade and for the group as a whole, the average number of errors is higher in the second test where the discriminative element is in the medial or final position than in the first test where it is in the initial position.

In order to determine whether there was a real difference, in the number of errors the pupils made, as between Test I and Test II, the *t* test for related measures was applied.

Here we see that the results obtained for the group as a whole could have been obtained by chance less than 1 per cent of the time. This is also true for all of the individual grades except the second. Since a *t* of 2.57582, at an infinite number of degrees of freedom, indicates assurance at the 1 per cent level and these scores are well above that, there is a real difference between the scores on the two tests. In the second grade the *t* of 1.1554 indicates that the results could have been obtained by chance about 24 per cent of the time. Although the reason for this

difference between the grades is not known, there are several factors which may have contributed to this finding. It may be, for example, that the children of the second grade are more consciously aware of sound elements because word study has just begun to be emphasized at this level. The children have been studying word beginnings, word endings, and the likenesses and differences involved in them. In the upper grades, whole word meaning is emphasized and the separate sound elements may no longer be as important to the student. As we learn more things, we are less consciously aware of those already learned, and since the phonetic aspect of words is emphasized most in the lower grades, this may account for the difference found in this study. However, this finding may be a function of the group tested. From the results, however, we can say that in general there is a real difference produced in the number of errors made by elementary school children when the position of the discriminative element is changed. More errors are made when the consonant is in the medial or final position than when it is in the initial position.

TABLE II. TABLE SHOWING *t* AND LEVEL OF SIGNIFICANCE FOR THE DIFFERENCE IN NUMBER OF ERRORS BETWEEN TEST I AND TEST II IN GRADES 2, 3, 4, 5, 6, AND THE TOTAL GROUP.

	t	*df*	*Level of Significance*
Grade 2	1.1554	∝	24%
Grade 3	3.7400	∝	Beyond 1%
Grade 4	6.3950	∝	Beyond 1%
Grade 5	6.3160	∝	Beyond 1%
Grade 6	3.6890	∝	Beyond 1%
Total Group	8.8860	∝	Beyond 1%

Because of the time required to administer the 366 items in the Travis-Rasmus Test, or the 200 items in the combination of the two tests described, it was attempted to construct a shorter test which could be used satisfactorily. In order to do this, the errors made by each pupil on each item were tabulated. The number of errors on the first test ranged from two on [ðɪ-dʒil] to 251 on [fi-θi], and on the second test from three errors on [is-itʃ] to 273 on [eð-ev]. In both tests the [f-θ] and [ð-v] items were found to be the two most frequently missed. Travis and Rasmus found these same items [fɑ-θɑ] and [ðɑ-vɑ] missed most frequently (2).

The distribution of errors was definitely skewed to the right; that is, they were massed where comparatively few errors had been made. Those items in both tests which had been missed by approximately 10 per cent of the total group, or passed by only 10 per cent, were discarded. The 70 middle items were used as a shorter test. These 70 items included 32 with the consonant in the initial position and 38 with the consonant in the medial or final position. Twenty-one items were taken from the first test only, 25 from the second test only, and 24 from both tests.

The proportions of the various types of items included changed greatly from the combined test to the shortened test, as shown in Table III. In making up the Short Test from the Combined

TABLE III. TABLE SHOWING NUMBER OF TYPES OF SOUNDS IN 200 ITEMS OF COMBINED TEST AND 70 ITEMS OF SHORT TEST.

	Combined Test	Short Test
Nasal	14	10
Plosive	24	12
Fricative	68	24
Combinations	12	3
Semi-Vowel	40	6
Mixed:		
Plosive-Fricative	8	4
Combination-Fricative	20	9
Semi-Vowel-Plosive	4	2
Semi-Vowel-Fricative	10	0
	200	70

Test the least relative decrease in number of items occurred for the nasal sounds, and the largest relative decrease occurred for the semi-vowels and the semi-vowel-fricative combination. The range of errors in the Combined Test was from 7 to 101, and in the Short Test it was 4 to 43. The average number of errors for the Combined Test was 23.72, and for the Short Test the average was 18.29.

The correlation of the combined scores on Test I and Test II with the scores on the Short Test was $.818 \pm .013$. When the test for linearity was applied, however, it was discovered that the correlation was non-linear. The correlation ratio for the prediction of the Short Test in terms of the Combined Test was .922.

The educational age, reading comprehension age and spelling age, as determined by standardized tests, plus grade level, and hearing acuity as measured by the Western Electric 4A Audiometer were available for 234 children in the third, fourth, fifth, and sixth grades. The second grade could not be included since all of this information was not available at this grade level. Intelligence was not included since the Otis Test is used in the sixth grade and the Kuhlman-Anderson in the other grades, and since some of the data was over three years old while other data had just been obtained. All of the information included had been obtained within several months of the administration of the sound discrimination tests. Travis and Rasmus reported a correlation of .094 between intelligence and sound discrimination scores of normal speakers (**2**).

The number of errors on the Combined Test and the number of errors on the Short Test were correlated with the available independent measures. Although low, the correlation with

educational, reading comprehension and spelling age are statistically significant and in agreement as to direction.

TABLE IV. TABLE SHOWING CORRELATION OF NUMBER OF ERRORS IN COMBINED TEST AND NUMBER OF ERRORS IN SHORT TEST WITH EDUCATIONAL AGE, READING COMPREHENSION AGE, SPELLING AGE, GRADE AND HEARING LOSS.

	Errors on Combined Test		Errors on Short Test	
Educational Age	−.203	±.042	−.207	±.042
Reading Comprehension Age	−.206	±.042	−.189	±.043
Spelling Age	−.233	±.042	−.260	±.041
Grade	−.162	±.054	−.129	±.055
Hearing Loss	−.034	±.058	−.013	±.067

Although all of the correlations are low, the consistency of the correlations of the Combined and Short Tests indicates that if the Combined Test is a valid test of sound discrimination then the Short Test is equally valid.

In checking the reliability of the Combined Test, we find the correlation between the first and second test to be .636. Considering these as chance halves, the obtained correlation coefficient would indicate a reliability for the Combined Test of .778. However, this method assumes that the halves are of approximately equal difficulty, and we have shown that there is a real difference between the two halves; therefore, this figure is not necessarily indicative of the true reliability of the Combined Test.

We are most interested, however, in the reliability of the Short Test. Here the odd items were correlated with the even items and the reliability coefficient was found to be .712. This is not high. However, the reliability of the Travis-Rasmus Test, containing 366 items, has been reported as .72 (**2**). If we were to double the length of this Short Test, using the same items twice, perhaps changing the vowels, we can predict a reliability of .838 on the 140 items. It would seem, then, that the Short Test of sound discrimination can be used.

IV. SUMMARY AND CONCLUSIONS

In conclusion this study of sound discrimination ability indicates:

1. That there is a real difference produced in the scores made on a sound discrimination test when the discriminative element is changed from the initial to the medial or final position. The children in all grades made more errors when the consonant or combination was in the medial or final position. In the second grade the results obtained with respect to this positional effect could have been obtained by chance 24 per cent of the time; in all other grades, and for the group as a whole, they could have been obtained by chance less than 1 per cent of the time.

2. That a relatively short test of sound discrimination can be effectively used. The correlation ratio for the prediction of the score on the Short Test of 70 items from that on the Combined Test of 200 items is .922. The Short Test correlates with independent measures approximately as does the Combined Test. The odd-even reliability of the Short Test is .712. If the Short Test was increased to 140 items, using the same items twice, the reliability would be .838.

V. Short Test of Sound Discrimination

EXAMPLES:
te-de
ere-ere
os-og

KEY: All D Except:
A. 1, 8
B. 1, 6, 8, 10
C. 3, 6, 8, 9
D. 4, 9, 10
E. 3, 9
F. 3, 7
G. 3, 6

A.	B.	C.	D.
1. te-te	1. ne-ne	1. fo-θo	1. pe-ke
2. hwe-we	2. dʒe-tʃe	2. vo-ðo	2. tʃo-ʃo
3. ne-me	3. ʃe-tʃe	3. zo-zo	3. ki-ti
4. ðe-de	4. im-iŋ	4. ʃe-ʒe	4. eb-eb
5. fi-vi	5. hwi-wi	5. fi-θi	5. ehwe-ewe
6. he-pe	6. ge-ge	6. ze-ze	6. en-em
7. se-ze	7. dʒi-tʃi	7. mai-nai	7. eð-ed
8. θe-θe	8. fai-fai	8. θe-θe	8. ehe-epe
9. ʒe-dʒe	9. ðe-ve	9. he-he	9. ov-ov
10. vo-bo	10. pe-pe	10. dʒi-ʒi	10. eθ-eθ

E.	F.	G.
1. eʒ-edʒ	1. eð-ev	1. if-iθ
2. ov-ob	2. et-ep	2. aim-ain
3. ed-ed	3. ep-ep	3. eθ-eθ
4. en-en	4. of-oθ	4. ini-iŋi
5. edʒ-etʃ	5. ov-oð	5. ef-ep
6. eʃ-etʃ	6. ed-eg	6. eð-eð
7. imi-iŋi	7. em-em	7. idʒ-iʒ
8. ihwi-iwi	8. eð-ez	8. ep-ek
9. eg-eg	9. airai-aiwai	9. otʃ-oʃ
10. is-iz	10. eʃ-eʒ	10. ez-eð

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(1) Templin, Mildred, and Steer, M.D. Studies of growth of speech of preschool children, *J. of Speech Disorders*, 1939, **4**, 71-77.
(2) Travis, L. E., and Rasmus, B. J. The speech-sound discrimination ability of cases with functional disorders of articulation, *Q. J. of Speech Educ.*, 1931, **17**, 217-226.

A NOTE ON VOICE RECORDINGS

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I. Introduction

The recording machine has come into greater and greater prominence as a part of the school speech correction program. What is its value? This study attempts to contribute a small amount of information toward answering that question.

II. Procedure

Part A: At Iowa State Teachers College all entering students take a speech examination administered by four speech teachers under the direction of the experimenter. Each student reads selected prepared sentences and, in so far as time allows or it seems desirable, talks briefly with the instructor. Details of what the examiners judge are not significant for this study. Among other things they rate the student's pitch as high, medium, or low; his rate as too fast, satisfactory (in the sense of not being too fast or too slow), or too slow; and his loudness as being too loud, satisfactory, or not loud enough. All students in the Fundamentals of Speech course make a recording of their voices at the beginning of the quarter in a sound-conditioned studio and on an RCA MI-12700 De Luxe recorder. They make judgments of their own voices before making the recording and immediately after hearing it when the recording is completed. Their judgments include ratings of voice similar to those mentioned above. They may indicate "Don't know" for any of the items included. The data from the student's and from the instructor's judgments are compared.

Part B: Since four instructors were doing the checking, a comparison was made of their respective judgments. This was done by having all four together listen to fifty different speakers and judge them as indicated above.

III. Results

Table I shows the effect on the student's judgment of hearing a recording of his voice, as compared with an instructor's judgment, on pitch, rate, and loudness. Column 1 gives the nine possible directions of movement of student opinion. For example, 1. "Agree to agree" indicates the student agreed with the instructor both before and after hearing his voice recording; 2. "Don't know to agree," that he didn't know before but agreed with the instructor after hearing his recording; etc.

Table II groups the results presented in Table I under three broad headings: A), students who moved toward the instructor's

TABLE I. Relation of Students' Judgments to Instructor's Before and After Hearing a Recording of Their Voice

	Pitch		Rate		Loudness	
	No.	%	No.	%	No.	%
1. Agree to agree	87	46.03	38	26.95	57	33.33
2. Don't know to agree	5	2.70	7	4.97	33	19.30
3. Disagree to agree	18	9.53	25	17.73	29	16.96
4. Agree to disagree	35	18.52	19	13.48	7	4.03
5. Don't know to disagree	0	0	13	9.22	6	3.45
6. Disagree to disagree	40	21.17	34	24.12	13	7.60
7. Don't know to don't know	0	0	3	2.13	11	6.37
8. Disagree to don't know	1	.53	1	.71	13	7.60
9. Agree to don't know	3	1.59	1	.71	2	1.11
Total	189	100	141	100	171	100

opinion after hearing the recording (Items 2, 3, and 8); B), those who did not change their judgments (Items 1, 6, and 7); and C), those who moved away from the instructor's judgment after hearing the recording (Items 4, 5, and 9).

TABLE II. Direction of Movement of Students' Judgment Relative to Instructor's Judgment After Hearing Voice Recording

	Pitch		Rate		Loudness	
	No.	%	No.	%	No.	%
A. Toward instructor	24	12.76	33	23.41	75	42.63
B. No change	127	67.20	75	53.20	81	48.53
C. Away from instructor	38	20.11	33	23.41	15	8.59
Total	189	100	141	100	171	100

Table III compares the ratings of four instructors of fifty students made at the same time and on the same items.

TABLE III. Comparative Rating by Four Instructors of Fifty Students on Pitch, Rate, and Loudness

	Pitch		Rate		Loudness	
	No.	%	No.	%	No.	%
A. Four agree	10	20	28	56	24	48
B. Three agree, one differs	26	52	12	24	17	34
C. Two agree but differ from two others who agree	11	22	9	18	9	18
D. Two agree, two differ and differ from one another	3	6	1	2	0	0
Total	50	100	50	100	50	100

IV. Summary

1. After hearing a recording of their speech, a number of students moved closer to the instructor's judgment of pitch (12.76%), rate (23.41%), and loudness (42.63%).
2. In many cases, hearing the recording of his speech did not change the student's judgment of his pitch (67.20%), rate (53.20%), and loudness (48.53%). Many of these students already agreed with the instructor's judgment: pitch (46.03%), rate (26.95%), and loudness (33.33%).
3. In some cases, after hearing a recording of his voice, the student moved away from the instructor's judgment of pitch (20.11%), rate (23.41%), and loudness (8.59%).
4. Four instructors judging fifty students differed considerably in their judgments of pitch, rate, and loudness. For pitch, 20 per cent of the cases showed complete agreement among the four judges, 52 per cent showed 3 judges agreeing and one differing, 22 per cent showed 2 differing from the other 2, and 6 per cent showed 2 agreeing and the other 2 differing and also differing from one another. For rate, the corresponding proportions were: 56 per cent, 24 per cent, 18 per cent, and 2 per cent. For loudness the corresponding proportions were: 48 per cent, 34 per cent, 18 per cent, and 0 per cent.

V. Interpretation

The two parts of this study supplement one another. The first part indicates that hearing a recording of one's speech (without discussion or analysis) has a widely varying effect on the students involved. The second part warns that interpretations of the meaning of these differences must be made with a realization that "experienced" and "trained" judges differ in their analysis or rating of three of the basic factors of voice, even when judging them directly and from their original source.

MEMO

The Committee on Rehabilitation is preparing a roster of speech correctionists for work with the war injured. If interested, you are urged to write immediately to Dr. Raymond Carhart, Committee Chairman, Speech Clinic, Northwestern University, Evanston, Illinois.

EDITORIAL NOTES

(*Continued from Page 122*)

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In a letter of February 19 of this year the outgoing Editor, Professor G. Oscar Russell, stated that, while Editor, he had accepted for publication articles by Carl Ritzman, Raymond Carhart and Harry J. Heltman and Georgiana Peacher. He expressed the hope that these agreements would be honored. He explained that in the case of the Ritzman article, an abstract, without tables or cuts, had been included inadvertently in the December issue, and he concluded by saying, "I hope you will see fit to keep my commitment to Dr. Ritzman and publish the article in full." The Editor and members of the Editorial Staff who were consulted felt it a privilege to honor Professor Russell's commitments, and the three articles appear in full in this issue of the *Journal.*

—The Editor.

MISARTICULATION AND DIADOKOKINESIS IN THE SPASTIC PARALYTIC*

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I. Introduction

Persistence of the symptoms of speech defects in the spastic paralytic is sufficiently frequent to demand our attention. The present study is based on the results of examining individually 102 children with spastic paralysis. In it an attempt is made to determine the frequency and distribution of speech defects and the rates of diadokokinesis in this group.

II. Procedure and Subjects

A test was constructed to discover the articulatory defects of each child. One hundred and twelve speech sounds were tested. A word test was used followed by conversation in order to find all the inaccuracies of speech and anomalies of voice. For each sound, words were used that contained that sound in the initial, medial, and final positions. Each child was asked to repeat one word at a time after the examiner.

In order to discriminate the dyslalias with an organic from those with a functional etiology, a neurological examination was made in an attempt to ascertain the condition of those cranial nerves which are involved in enunciation. Included are the facial, hypoglossal, glosso-pharyngeal, trigeminal and vagus nerves. When a lesion was indicated in one of these nerves, it was stated that the defective production of the sounds, which are articulated predominantly by the muscles that the nerve in question innervates, was of an organic causation. When the defective production of sounds involved entirely mobile muscles, the dyslalia was classified as functional.

The I.Q. for each child was determined by means of the Stanford-Binet Intelligence Test. The distribution of I.Q.'s was as follows:

10–19	1	80–89	15
20–29	3	90–99	14
30–39	3	100–109	15
40–49	3	110–119	6
50–59	4	120–129	0
60–69	13	130–139	1
70–79	19		

Diadokokinetic rates were determined for the following movements:

1. Repetitive movements of opening and closing the jaw.
2. Opening and closing the lips without voice (surd).
3. Opening and closing the lips with voice, repeating b, b, b (sonant).

*Submitted by the junior author in partial fulfillment of the requirements for the degree of Master of Science in the Graduate School of Syracuse University, 1942.

4. Movements of the tongue to the ruga palatinum and down (surd).
5. Repetitive movements of the tongue to the ruga palatinum and down, repeating la, la, la (sonant).
6. Tapping the forefinger of the right and left hand, separately.
7. Pronation and supination of the forearms separately.

The diadokokinetic ratings were taken by the electronomic test. The device used was an electric metronome, called the electronome. A metronome of any type had not been used in testing diadokokinesis in any previous study. It appears to provide a valid and reliable method of measurement. The electronome has the advantage over the metronome of having a dial by which the various speeds are set. Therefore, the speed of the electronome was easily and quickly adjusted to the speed at which the subject was repeating the movements. Also the mechanical instrument runs down while the electrical one is more precise.

Each subject was instructed to make the diadokokinetic movements as fast as possible. As soon as the subject started, the stop watch mechanism was released, and the electronome was set at the speed at which the subject was making the movements. Ten seconds were given for each type of movement.

The data from this study were compared with those from a previous study by Severance (1). She investigated a group of 159 speech defective children, 8 to 15 years of age, who were physically normal. The ages of the spastic group ranged from 4 to 23 years. These children are beyond the normal speech developmental period, and in this sense the two groups are comparable in age. All of the 102 spastics were studied whether they presented overt speech defects or not.

III. Results

The findings from testing the articulation of 102 spastic children revealed the mean number of errors per child to be 66.19, with a standard deviation of 33.6, out of a possible 112 errors. The mean number of errors for the physically normal group with speech defects was 12.4, with a standard deviation of 2.46. The range of errors for spastics was 0-112 and for the physically normal group it was 0-59. These data indicate a greater frequency of speech defects in the spastics. The mean number of errors in the spastic group exceeds the greatest number of errors made by any one physically normal child.

The correlation of age with the number of articulatory errors, for the spastic group, was $-.14$, with a standard deviation of .097. Thus it may be concluded that a very slight relationship, if any, exists between age and speech defects in this group. The correlation is so low, however, that it may be said that as the spastic grows older, his speech does not improve.

The order of difficulty of speech sounds for children with spastic paralysis was determined and a comparison was made for

each sound of this study with each sound from the Severance study on physically normal children. The critical ratios for all sounds were highly significant statistically except for the [s]. These high critical ratios reveal that a true difference exists between the percentage of speech defects in the spastics and in the physically normal children. For every sound except [ŋ] the spastic group had a statistically higher number of errors. In reference to [ŋ], the difference is significant, but the greater percentage of errors was found in the physically normal group. This is accounted for by the different methods of testing for that sound. The Severance study tested for a language variation, whereas this study tested only for the sound itself. That is, even if the first group were able to enunciate [ŋ], as in si*ng*, if they enunciated the [g] in the medial position in si*ng*ing, they were said to have a defective [ŋ].

The only sound which did not show a significant difference between the two groups was [s]. The critical ratio was .224, showing that the extremely small difference was due to chance. The proportion of errors on [s] in the spastic group was 62 per cent and in the physically normal group of speech defectives it was 60 per cent. Because of the low critical ratio, we can conclude that those with spastic paralysis do not have any more difficulty with [s] than do speech defective children who are physically normal.

Of the sounds, those which showed the greatest difference between spastic and physically normal children were [k], [l], [v], [tʃ], [ʃ], [t], [b], and [m]. Of the consonant combinations, [dl] showed the greatest difference, with a critical ratio of 26.03. The [dl] and [tl] blends were the most difficult of all sounds for the spastics to enunciate. They were not particularly difficult for the physically normal children.

It was discovered that of the spastic group, there were as many individuals with psychogenic dyslalias as there were with physiogenic dyslalias. Approximately 50 per cent of the spastics' dyslalias were of organic origin and 50 per cent of functional origin. For each spastic with paralyzed articulators and dyslalia, there was one spastic with normal articulators and dyslalia. The critical ratios between the percentages representing organic errors and those representing functional errors ranged from 0.00 to 1.84. These are too low to be of statistical significance. The number of functional misarticulations presented by the spastics was as great as the total number of misarticulations presented by the physically normal children. Since this physically normal group consisted of speech defectives only, we can conclude that children afflicted with spasticity have a much greater number of functional defects of speech than do physically normal children.

The differences between spastic and non-spastic children in the proportions of errors in the various positions of articulatory sounds will be found in Table I. Here it is demonstrated that the greatest difference in positional (kinaesthetic) sense of speech

sounds between the spastic and physically normal group exists in the lingua-rugal sounds. The spastics have the greatest amount of difficulty with these sounds. Since lingua-rugal sounds depend heavily upon the mobility of the tongue, it seems that the spastic's greatest difficulty comes from a hypoglossal paresis. Actually, there were 35 cases of the 102, or 34 per cent, with a hypoglossal paralysis. This constitutes the major handicap to the articulation of the spastics. Of the 35 cases with a palsy of the tongue, 8 were

TABLE 1. DIFFERENCES IN THE PERCENTAGE OF ERRORS IN THE VARIOUS KINAESTHETIC POSITIONS OF ARTICULATION BETWEEN THE SPASTIC GROUP AND THE PHYSICALLY NORMAL GROUP

Articulatory Position	Mean % of Errors (Spastics)	Mean % of Errors (Non-Spastics)	Diff.	Critical Ratio
Labials [b], [p], [m], [v], [f]	20 04 [6]	02 01 [6]	18	4.33
Lingua-Dentals [θ], [ð]	45 05 [6]	26 03 [6]	19	3.26
Lingua-Rugals [l], [t], [d], [r], [n], [s], [z], [ʃ], [ʒ], [dʒ], [tʃ]	42 05 [6]	18 03 [6]	24	6.80
Lingua-Palatals [j]	14 04 [6]	00 00 [6]	14	3.96
Lingua-Velars [k], [g], [ŋ]	24 02 [6]	14 03 [6]	09	1.82
Lingua-Velar exclusive of [ŋ]	22 04 [6]	01 01 [6]	22	4.87

bilateral, 12 were right unilateral, and 15 were left unilateral. The next group of sounds which gave a statistically significant difference between the normal and the spastic children is that of the lingua-velar sounds when the [ŋ] is discounted because of the different methods of testing this sound in the two groups. These sounds are made mostly by the action of the tongue, if we may so judge from the fact that there were but 8 cases of the 102, or 8 per cent, with lesions of the glossopharyngeal and of the vagus nerves, which together produce a paralysis of the velum palatinum. There were 4 right hemiplegias and 4 left hemiplegias. The position which gives the next greatest difference is the labial. There were 16 cases, or 16 per cent, with a facial paralysis. This, in part, is the reason for the difficulty which the spastic has in articulating the labial sounds. There were 7 cases of bilateral facial paralysis, 8 cases of right facial hemiplegia, and 1 case of left facial hemiplegia. The lingua-palatals and lingua-dentals showed the next greatest difficulty. These are again articulated mainly by the tongue. The table shows, then, that the spastic

has the most difficulty in contacting the tongue with the ruga palatinum, and this, to an extent, is due to the hypoglossal paralysis.

TABLE 2. ORDER OF DIFFICULTY OF SPEECH SOUNDS IN THE VARIOUS TYPES OF SPASTICITY.

Quadraplegia Combined Athetosis and Spasticity (N = 17)		Athetoid Quadriplegia (N = 9)	Spastic Quadriplegia (N = 19)	Spastic Diplegia (N = 18)	Spastic Monoplegia (N = 9)	Spastic Left Hemiplegia (N = 10)	Spastic Right Hemiplegia (N = 18)
Speech Sound	% of Errors	% of Errors	% of Errors	% of Errors	% of Errors	% of Errors	% of Errors
[s]	93	91	70	33	50	44	43
[ʒ]	86	73	71	39	37	33	57
[z]	64	82	58	44	37	56	48
[r]	64	82	70	44	62	56	48
[l]	93	73	70	33	50	44	52
[θ]	79	82	48	33	50	44	57
[ʃ]	71	64	58	28	24	33	43
[tʃ]	71	55	41	28	37	33	33
[ð]	57	45	53	06	37	33	43
[dʒ]	57	55	35	22	00	11	19
[v]	36	45	48	06	24	22	10
[ŋ]	50	64	35	00	00	22	14
[t]	50	36	41	00	24	11	19
[g]	43	55	29	06	00	22	10
[k]	43	27	29	06	12	22	10
[b]	57	27	18	00	12	11	10
[m]	50	27	24	06	00	11	10
[n]	50	36	24	06	00	11	10
[d]	36	45	18	06	00	11	10
[f]	29	36	35	00	00	11	10
[p]	43	18	18	00	00	22	10

The order of difficulty of the various sounds and the proportions of errors found in the various classifications of spastic paralysis are given in Table 2. The seven classes of spastic paralysis, in order of the greatest to the least proportion of articulatory errors, are as follows:

1. Quadriplegia involving combined athetosis and spasticity.
2. Quadriplegia of the athetoid type.
3. Spastic quadriplegia.
4. Spastic right hemiplegia.
5. Spastic monoplegia.
6. Spastic left hemiplegia.
7. Spastic diplegia.

Quadriplegia involving combined athetosis and spasticity was characterized by a consistently higher proportion of dyslalias than was found in any other group.

The proportion of cases with dysphonia for each spastic condition is given in Table 3. Of the nine athetoids, 8 cases, or 89 per cent, had dysphonia. Of the 17 quadriplegias with athetosis

and spasticity, 14 cases, or 71 per cent, had dysphonia. Of all the fixed spastics, about half were handicapped with dysphonia and half were not.

The dysphonia group did not contain any aphonias. While there were 7 alalias, all had voice, even though in some it was not more than a cacophony.

The greatest number of dysphonias were disorders of pitch, quality, and volume. All those with pitch disorders were monotones. Disorders of quality consituted trachyphonia, stridor, and straining. Except for one case, rhinolalia was not pronounced. This is probably because the hoarseness was so outstanding that it covered up any rhinolalia that may have been present. All disorders of volume were those involving a lack of adequate loudness.

TABLE 3. DYSPHONIA IN VARIOUS TYPES OF SPASTICITY

Type of Spasticity	% with Dysphonia	ϕ	Total Cases
Athetosis	89	.10	9
Athetosis and Spasticity	71	.11	17
Spastic Quadriplegia	53	.11	19
Spastic Right Hemiplegia	44	.12	18
Spastic Left Hemiplegia	30	.12	10
Spastic Diplegia	44	.12	18
Spastic Triplegia	67	.27	3
Spastic Monoplegia	25	.15	8

Chi Square was computed for these data, as shown in Table 4, and the value obtained was found to be 13.717, which is statistically significant in showing that the difference between the number of cases presenting dysphonia and the number not presenting dysphonia is a true difference. It can be stated, therefore, that cases with athetosis alone or in combination with spasticity are more likely to have voice disorders than not to have voice disorders. Spastic left hemiplegias are more likely not to have dysphonia. Approximately half of the spastic quadriplegias, spastic right hemiplegias, spastic diplegias, and spastic monoplegias will have dysphonia and half will be without dysphonia. The Chi Square is also interpreted to mean that the probability that, in a random sampling of measurements such as has been obtained, there are less than five chances in one hundred that a departure from the theoretical frequencies could be as large as the ones that were found. This means that the differences found are not due to chance.

Sex differences with respect to speech defects were not statistically significant. The critical ratios for males and females with regard to the proportion of articulatory errors, ranged from .00 to 2.24. The least amount of difference was on [f], while the greatest difference was on the [ŋ]. Males had 41 per cent errors and females had 21 per cent errors on the [ŋ].

There were 4 cases, or 3.9 per cent, of the spastics who pre-

sented dysphemia, or stuttering. All were of the clonic type. Three were males and one was female. This is the same proportion and the same sex ratio as found in the physically normal individuals studied by Severance.

TABLE 4. DYSPHONIA IN THE VARIOUS TYPES OF SPASTICITY

	Athetosis	Athetosis and Spastic	Spastic Quadriplegia	Spastic Right Hemiplegia	Spastic Left Hemiplegia	Diplegia	Triplegia and Monoplegia	Total
			With Dysphonia					
Mab*	8.00	14.00	10.00	8.00	3.00	8.00	4.00	55
tAB**	4.85	9.17	10.25	9.71	5.39	9.71	5.93	
dAB***	3.15	4.83	−.25	−1.71	−2.39	−1.71	−1.93	
d^2AB†	9.92	23.33	.06	2.92	5.71	2.92	3.72	
d^2AB‡	2.05	2.54	.0059	.03	1.06	.03	.627	
			Without Dysphonia					
Mab*	1.00	3.00	9.00	10.00	7.00	10.00	7.00	47
tAB**	4.15	7.83	8.75	8.29	4.61	8.29	5.07	
dAB***	−3.15	−4.83	.25	1.71	2.39	1.71	1.93	
d^2AB†	9.92	23.33	.06	2.92	5.71	2.92	3.72	
d^2AB‡	2.39	2.98	.0069	.035	1.24	.035	.627	
Total	9.00	17.00	19.00	18.00	10.00	18.00	11.00	102

$X^2 = (d^2AB) = 13.717$
tAB
n = 6# Probability = .05

*actual frequency
**theoretical frequency
***difference between actual frequency and theoretical frequency
†difference between actual frequency and theoretical frequency squared
‡difference between actual frequency and theoretical frequency squared divided by the theoretical frequency
#degrees of freedom.

Another disorder found in the spastics was hypacusis. Six cases of the 102 had hypacusis. Of these, two had anacusis. This would be a factor in the causation of speech defects in these six cases.

Diadokokinetic rates of the spastics are given in Table 5. These rates are below those found in non-spastics. Jenkins (2) states that there appears to be an increase of diadokokinesis as age increases. This is true of spastics. The correlation of the rate of diadokokinesis and age in the spastic group was +.69, with a sigma of .052, a statistically significant correlation, indicating that the spastics' rate of diadokokinesis increases with age.

This study shows that a negative relationship exists between extent of misarticulation and the rate of diadokokinesis. The correlation between diadokokinesis and number of speech errors was

—.64 with a sigma of .058. This indicates with statistical significance that the greater the rate of diadokokinesis the fewer the number of articulatory errors. This correlation, with age partialed out, was even more highly significant statistically. It was —.76.

TABLE 5. RATE OF DIADOKOKINESIS IN 102 SPASTIC SUBJECTS IN NUMBER of MOVEMENTS PER SECOND

	Mean	Sigma	Range	C.R.
Jaw	1.95	1.69	0– 6.77	
Lips (Surd)	1.50	2.86	0–13.86	8.13
Lips (Sonant)	4.85	3.09	0–13.86	
Tongue (Surd)	2.31	1.93	0– 8.60	4.88
Tongue (Sonant)	3.93	2.69	0–10.40	
Right Arm	1.03	.79	0– 3.47	
Left Arm	1.06	.95	0– 3.06	
Right Finger	2.90	2.47	0–13.90	
Left Finger	2.73	2.42	0–13.90	

Another finding of importance was the difference between the diadokokinetic movements of the tongue with and without voice. While the mean rate of the diadokokinetic rate for the tongue movements for all spastics was 2.31 per second without voice, the mean rate increased to 3.93 movements per second when voice was used. The critical ratio for the difference between these two means was 4.88. Therefore, a real difference exists. The same was even more true of the movements of the lips. The mean rate of diadokokinesis of the lips for surd sounds was 1.50 per second and for sonant sounds it was increased to 4.85. The critical ratio for the difference between the surd and sonant lip movement means was 8.13. This indicates a real difference.

IV. SUMMARY

A group of 102 cases of spastic paralysis, ranging in age from 4 to 23 years, was compared with a group of 159 non-spastic speech defectives, ranging in age from 8 to 15 years, with respect to incidence of misarticulation of speech sounds. Rate of movement (diadokokinesis) of lips, jaw, tongue, arms and forefingers was determined for the spastics. The spastic group was tested by the present writers and the non-spastic group was investigaged by Severance (1). The main findings were:

1. Except for [s] and possibly [ŋ], all sounds were misarticulated more frequently by the spastics than by the non-spastics, and the differences were statistically significant. An attempt was made, by means of neurological examinations, to differentiate organic from functional dyslalias in the spastics, and it was concluded that they presented as many of the one type as of the other and more of both types than did the non-spastics.

2. The lingua-rugal sounds were most difficult for the spastics.

3. Quadriplegia involving combined athetosis and spasticity was characterized by a consistently higher proportion of dyslalias than was found in any other group.

4. There were no significant sex differences among the spastics with respect to articulatory defects.

5. Cases involving athetosis alone or in combination with spasticity are more likely than not to present dysphonias. Of the cases with spasticity only about half presented dysphonias. There were no cases of aphonia.

6. Four spastics, or 3.9 per cent, three male and one female, were also stutterers. This was the same proportion and same sex ratio as were found in the non-spastic group.

7. Four of the spastics were hard of hearing and two were deaf.

8. Diadokokinetic rates for the spastics were lower than those reported by Jenkins (2) for non-spastics.

9. A negative correlation of $-.64$ was found between diadokokinetic rate and number of misarticulations for the spastics. With age held constant, the correlation was $-.76$; diadokokinetic rate was found to increase with age in the spastic group, as shown by a correlation coefficient of .69.

10. Rates of lip and tongue movement of the spastics were significantly greater with than without phonation.

V. Conclusions

Since the speech of children handicapped by spastic paralysis does not improve as they reach maturity, speech habilitation should be started at an early age. A further reason for the early beginning of speech training is to be found in the large number of functional dyslalias among spastics. Spastic children have, in addition to their many organic speech disorders, a greater proportion of functional speech defects than are found in non-spastics. This would seem to point to the importance of psychological factors. Consequently, the speech training should begin before the processes of learning are too strongly impressed.

Brief comment can be made, on the basis of the present study, concerning the spastic paralytic's specific needs with regard to speech training. Inasmuch as approximately half of the speech difficulty appears to be due to paralyzed articulators, these muscles should be given exercises for relaxation and for strengthening.

Moreover, in view of the fact that diminished diadokokinesis bears a definite relationship to defective speech in the spastic, diadokokinetic exercises of the tongue, lips, jaw, and velum palatinum are indicated. It is also to be noted that the rate of diadokokinesis was increased when voice was used. In view of this fact, sonant movements would appear to have particular value in diadokokinetic exercises for the spastic.

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(*Continued on Page* 154)

THE SPASTIC SITUATION

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One of the three sub-divisions of cerebral palsy is spasticity. Being a complete spastic myself, I must write only from my own half-century of experience which has forced me to discover, analyze to the point of understanding, and then deal with what I term the *spastic situation*, and its direct and disastrous effects upon the *spastic condition*. Were this *spastic situation* understood in detail, and dealt with intelligently, the spastic condition would be so modified as to be no longer hopeless; this I have good reason to regard as fact. Hence my single purpose in writing this article is to explain in some detail what the spastic situation is, and what its direct bearing on the spastic condition is.

I know nothing about the spastic condition beyond the fact that due to a physical injury sustained at birth some nerve cells are destroyed, leaving the individual without proper control of nerves and muscles. Hence the individual should be regarded just as any severely injured person is regarded. He is not so regarded, however, because the nature of his trouble is not understood, and this fact is the beginning of the spastic situation.

People are so obsessed with the idea that "the body is the expression of self—of individuality," that they forget that this is true only when the body is in a normal condition and so able to perform adequately its office in being the expression of self.

When the body is so devoted to the expression of spasticity, as to be of no use in expressing one's personality, individuality must await expression. The fact that perfect individuality is present awaiting expression is proved when, for example, by the use of his understanding of English together with the use of his typewriter, the individual finds self-expression—and self-development.

Instead of taking all these things into account, the normal man invariably persists in looking to the body for the expression of personal worth, and not finding it, he concludes that the spastic has no personal worth, and is therefore his mental, as well as physical, inferior.

When the parents learn that their child has the spastic condition to endure, they think him very ill, and go to a doctor. As a rule, doctors talk possibilities, probabilities, ifs, ands, and maybe sos, until these parents are filled with abnormal concepts as to their child. When in time these concepts fade a shade less vivid, back to these doctors they go, to have them colored up, without realizing that this is what they go for.

In the first place, these poor parents are so panic-stricken that they are unfitted to use reason in promptly dismissing mal-assumptions, and in refusing to entertain them, and later they become such mental jitter-bugs as to need hospitalization to

straighten them out, but, sad to say, they do not get it for lack of a doctor who knows how to see to it that they are properly handled.

The result is that the mother of the child finds satisfaction in answering every idle question as to the child's condition, and in talking incessantly about both it and about what this and that doctor said.

By way of finding a new subject to talk about, and thereby making herself most entertaining, idle gossip relates all this mother has said, and adds a number of expressed opinions to it; idle gossip leads to bitter criticism, and then in struts social ostracism in all its vain glory to command this whole ground.

Social ostracism would use the spastic condition as a reasonable excuse for attempting to stamp out of sight the personal worth of the individual who has the spastic condition to endure; and because his body is so devoted to the expression of spasticity as to be of little use to him in expressing himself, this individual is long in discovering ways and means of self-defense.

In the meanwhile, social ostracism makes the following attempts to place the spastic in so impossible a social position as to be too inhuman for anyone to conform to.

It would rob the spastic youth of personal contacts with his fellow beings. It would slam shut in his face every school door. It would debar him from home and church; from the needed use of public libraries, and so on. It would see to it that his every successful effort to progress, and therefore make a man of himself, be set aside—stopped—by under-estimating his personal worth. It would deprive him of enjoying his own personal possessions, on the basis that others have more use for them than he has, and are therefore justified in robbing him of them.

In just such ways it would upset nerves until they jump and twist beyond human endurance, and contract muscles so tightly as to stop blood circulation, making bodily parts ache.

Social ostracism is like the devilfish with long, grabbing arms which reach out in every direction to grab one and then squeeze life, hope, and every other vital thing out of one—not to kill, but to torture.

In view of the spastic situation, as briefly detailed from the beginning of this article, is it any wonder that intense fear—stage fright—is the fundamental reason why the spastic cannot speak plainly, if at all? Could the normal man, even though he be a well-poised public speaker, and used to appearing in full dress, speak before a house like this one—might he not for the moment be struck dumb with stage fright? Is not such a house enough to upset anyone's nerves, and contract the muscles of his tongue beyond the power to speak for the moment?

"Not me; not I; not us, would serve the purpose of inflicting the least hardship upon the spastic!" declares every normal man, and all good folks mean what they say. But the point is

that they do not see, or understand, any of the facts included in the spastic situation, nor its disastrous effects upon the spastic condition—its part in increasing spasticity—nor do they understand how to do their part intelligently to destroy this situation and to stop playing a part in building it up.

The experienced, intelligent spastic could teach others to understand these things, but he will not do it. He has suffered so much from the ignorant form of the spastic situation that he is no longer willing to give real information into the hands of those not yet prepared to use it aright, and so run the risk of having it fall into the hands of idle gossip, mischief-making criticism, and diabolical social ostracism to use in building up the spastic situation higher, firmer, and in a more spellbinding way. "Nothin' doin'!"

For example, let us suppose that some teacher of speech correction should consider he had done well even to take the time to glance over this article; suppose he really read my statement that fear was the fundamental reason why a spastic cannot speak plainly, if at all; and suppose he took me just seriously enough to ask his pupil if he were afraid to talk, and to assure him that he need not be.

Without doubt, the spastic would deny that fear interfered with his speech, and for two reasons: Fear contracts muscles even in the tongue, and yet one is not afraid to talk—one just cannot talk on account of contracted tongue muscles. There is a difference to be carefully noted here between fear and the reaction thereto. Again, this teacher's condescending manner of personal approach and his wheedling tone of voice evidence the fact that he has allowed the spastic condition of his pupil to cause him to under-estimate his personal worth and so the teacher is unfitted to be trusted with the information on the subject which the spastic could give him.

As for me, long before I had worked three years in Dr. M. E. Pusitz's clinic as a teacher of spastic children, I had succeeded in my efforts to progress, to the point of holding an impersonal, objective, constructive view of the spastic situation. I still was wholly unwilling to explain this situation to any normal person, however, for I had sense enough to no more trust him with this information which he has no idea how to make good use of, than I would trust a hopelessly insane man with a sharp knife. While at work in the clinic, however, I lost my fear of social ostracism, and decided to express myself concerning the spastic situation by way of helping the spastic children of today to understand and deal intelligently with the spastic situation, and so enable them to progress in their school work, and in meeting their barriers much faster and with less effort than I had been able to do. No one had helped me in this respect for no one had known how, whereas I knew how to help these children and I certainly was going to do it.

One has to have some education in order to analyze the spastic situation to the point of understanding it, and of being able to deal with it intelligently. Otherwise he will either fail to overcome his barriers to the point of winning his education, or he will have no use for his education after he wins it. My fourteen spastic pupils were not going to make failures of their lives, if I could help it, by not dealing with the spastic situation in such a way as to overcome their barriers to progress, and neither were they going to make shipwrecks of their education by not being able to use it after they had won it.

The first step in dealing with the spastic situation to one's advantage is to discover that there are just as many abnormal concepts as to the impossible social position the spastic is to conform to, as there are people to form them, and that therefore he cannot and doesn't have to conform to any of them. Next, he must discover that it is not "consistency" which is the "jewel" in the spastic's case, but that it is the inconsistency of human nature that affords him a way of escape. Again, he must mark the great difference between social ostracism and social propriety, and follow up the guiding directions of propriety.

Social ostracism can deceive others as to what the spastic should, or should not, be permitted to do, by appearing in the disguise of social propriety but it cannot thus deceive the spastic, because of the difference in their respective demands upon him, and therefore the difference in their effects upon his nerves and muscles. By depriving him of everything which means normal life, social ostracism would stamp out of sight his personal worth, and thereby greatly increase his spastic condition. His perfect individuality is what causes him to suffer these things. Were he an idiot, he would not suffer thus. By permitting him to do anything in line with progress which he is physically free to do, social propriety enables the perfect individuality of the spastic to have first place in his life, as it normally should have, and so enables him to go ahead and make a man of himself.

Social propriety deprives the spastic of nothing, but permits him to do things under certain conditions. For examples: He can go to church, provided he does the considerate thing of going early, staying a few minutes late, and sitting in the back seat so as not to disturb those behind him by the way he wiggles— by the constant motion of his body due to the severe spastic condition. He can go to school, provided he can keep up with his classes; otherwise, he can be so persistent in his efforts of accomplishment as to interest efficient teachers in helping him after school hours, or on Saturdays. He can go on to college, provided he doesn't attempt to take part in the social life of the school. And so on with his liberty to do anything he should do, under certain provisions of a necessary sort.

How can a complete spastic attend college classes? By taking just enough notes on class lectures to write up his notebooks at home, by handing in his class recitations a day late, and in

script or in type and by taking his finals in some such way. I am not telling my reader how a severe spastic is to carry on college work but only telling him how I did it by way of convincing him that *it can be done.*

There is a healthy tendency among our best thinkers and world workers to so admire the set determination of the severe spastic as to befriend him in his efforts to progress. Hence in one way or another the spastic is given a chance to win his education.

There is an occasional instructor who would be rid of his spastic student for he considers that the care of the sick has been imposed upon him. It nettles him when his spastic student makes the best of grades in his college work. He would be rid of the whole matter, for exactly the same reason he would be rid of a horsefly which persisted in riding his nose.

In the case of the more able instructor the attitude toward the spastic student is more desirable from every angle. This instructor is so well versed in the psychology of human life that he pays just as much or just as little attention to his spastic student as he may see fit to pay to the rest of his hundred and one other students. He is there only to teach, and to put the work of the course of study over to his student body, and to give such personal aid to the individual student as can be asked for at the end of each class period. This instructor passes the spastic's way at times, because the spastic cannot come to him. He has a pleasant smile and a cheerful "Good morning!" for the parents who call to take the spastic from the classroom, and then he is gone—before these parents can bother him for attention. The greatly desired result is that he leaves his spastic free of any embarrassing circumstance which might otherwise retard his work as a student. I speak of this type of instructor somewhat at length, because such a one is so truly educated himself that the spastic situation cannot and does not exist in his presence.

If others would only think in line with the correct use of verbs, for example, this situation would be greatly modified, and therefore its bad effects upon the spastic condition would be greatly lessened. For example, we do not say that Johnnie *is* the mumps. We say that he *has* the mumps. Likewise it is definitely incorrect either to think or to say that a person *is* a spastic for there is no such thing as a spastic. The person is a perfectly normal individual who has the spastic condition to endure and since his body is devoted to the expression of spasticity, it is of little or no use to him in expressing himself. Hence he must find self-expression by use of good English and his typewriter and other like devices, as I have said elsewhere in this article.

The individual who has the spastic condition to endure has a great need of and use for a good education and when he grasps this fact he will both win and use it.

To use my own experience as an illustration: It was the spastic situation, as above described, which caused me so much mental and physical suffering that I had no peace. My intense fear and worry as to how I was to find self-expression enough to set forth my personal worth, and so command the respect of others to the point of making them stop under-estimating me and insulting me—this fear, worry and mental suffering so increased the jumping of nerves and contracting of muscles as to make it impossible for me even to go to bed for as long as three weeks at a time. During these years of my childhood I had no idea what to do about it, and so believed I had to suffer it. Many years later I discovered that my continuous and persistent effort to progress had to be made because my active mind and perfect physical health demanded it, and that these two facts promised me a way of escape from my suffering. This conviction made my determination to progress so set that nothing could bend it in the least. Hence my efforts met with more or less success as I slowly earned my way to college.

During this time my persistent efforts won me many friends among folks of every type and of many walks of life. It was our best thinkers and busy world workers who had time to help me in passing and who gave me the needed opportunity to win my education.

My college credits, my use of my education in retaining my own home with service, in managing my own business affairs, and otherwise carrying on independently—these things brought my personal worth to the attention of everyone, both in this and near-by cities. In this hour of peace, I gained the necessary amount of self-assurance to turn on the spastic situation and tell it to go to blazes. Hence my suffering from it is gone forever.

Not that the spastic situation went to blazes when I told it to but that I am now so free of it, and of the fear thereof, that I can analyze, describe and expose it to the point of giving others at least some idea as to how to understand and deal with it intelligently in behalf of the little spastic children of today, and so save them much of the suffering it will cost them otherwise.

In view of all the facts which I have above called to your considerate attention, is it not reasonable to believe that I know at least somewhat whereof I speak, when I again say: *There never can be a satisfactory regime of work on the physical side of the spastic case—the spastic condition can never be permanently improved—until the spastic situation becomes thoroughly known and duly taken into studious consideration.*

This statement is not one to pin new and old theories upon after a deal of daydreaming, but rather is it one to interest the active and trained mind in making a study of and in testing out the first-hand information which the intelligent, experienced and complete spastic can give, once he has mastered his fear of Mr. Social Ostracism and his conspirator, idle gossip, with its use of wagging tongues, bitter criticism, and so on.

Such a spastic should be appreciated as being of real service, and should be kept at work in the spastic field of labor where he rightly belongs—the lazy thing. It is his job to upset every mal-assumption regarding the spastic case, and to replace it with the true facts in the case, thereby giving doctors and scientists needed help.

Editor's Note: In a letter accompanying this article, Miss McKibben stated that she had written it in response to the persuasion of Dr. Martin F. Palmer. She acknowledged also the encouragement of Dr. M. E. Pusitz. The article by Dr. Palmer, which appears in this issue, develops certain interesting implications of Miss McKibben's statements.

In accepting the article for the *Journal*, the Editor assured her that it was a privilege for the American Speech Correction Association to publish what she had to say. It adds impressively to the background against which her article is to be evaluated, and provides certain additional information of importance, to quote in part from Miss McKibben's reply to this letter of acceptance:

"A complete spastic has a tendency to lose his head over a bit of praise, due to his struggling efforts to express his personal worth. Being a complete spastic myself, I always try to keep my eye on this fact, and govern my thoughts accordingly.

"In my study of people I note with sympathetic understanding that highly emotional people necessarily have to use a more gorgeous arrangement of expressive terms than do others, for otherwise the full expression of their being could not arrive, and arrive it must. On the contrary should a plain matter-of-fact person use more than a few expressive terms at a time, he would overstate himself. I try to take different types of people as they are.

"I do not get a word of praise very often, but when I do, I give myself a free lecture like this: 'Now, see here, Smarty, just what type of person complimented you? If he is of the highly emotional type, you are to appreciate what he said as being a most artistic expression of his thoughts and feelings, and you are to retain your sense of appreciation of that individual and forget yourself. If, however, the person who paid you a compliment chances to be a matter-of-fact person, then I will permit you to consider what he said as being reason for you to feel that you are progressing in your efforts to learn to put what you have to say across vividly to doctors and scientists. Watch your step, for I am not going to stay my own progress by indulging the complete spastic's trick of letting a word of praise go to his head.'

"My work in Dr. M. E. Pusitz's clinic opened my eyes to how very much the Doctor meant when he asked me to give him and his spastic patients the benefit of my experience; my correspondence with Dr. Palmer has encouraged me to believe I could learn to put what I had to say across to others; and so your letter to me of March 27th was most encouraging to me, in regard to my work being well begun. You wrote, 'You are doing a tremendously significant piece of work. . .' I should have been thankful had you only recognized that I had such a work to do, but the fact that you went further by saying I am doing it did fill me with new hope of success in my undertaking."

The rare wisdom and the extraordinarily adequate personality expressed in this letter add weight, in the Editor's judgment, to Miss McKibben's article.

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(*Continued on Page* 186)

SIMILARITIES OF THE EFFECTS OF ENVIRONMENTAL PRESSURES ON CEREBRAL PALSY AND STUTTERING

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West (**5**) was apparently the first investigator to report that there are many similarities between spasticity and stuttering. The subjective observation that the two conditions have many phenomena in common is often made by the clinician of experience. Of course, this observation is etiologically tempting, since the brain lesions found in cerebral palsy have been fairly well described in the literature. This paper, however, is not intended as an etiological study, but simply as a brief report on the very interesting similarities to be found in the effect of semantic pressures upon both cerebral palsy and stuttering.

Miss Stella McKibben (**2**), author of the article, "The Spastic Situation," in this issue of the *Journal*, is a case of severe cerebral palsy that has never been treated. She is about 65 years of age. She is ambulant only with extreme difficulty, usually rides in a motor-powered wheel chair, cannot talk intelligibly, but expresses herself quite adequately on the typewriter by means of a wooden rod the size of a pencil which has a large rubber tip on each end. Miss McKibben grasps her invention with her fist and is able to type at a really surprising rate of speed with it. She has had a college education and has had some years of experience in the instruction of children with cerebral palsy at the clinic of M. E. Pusitz, M.D. at Topeka, Kansas. The author has had the privilege of Miss McKibben's acquaintance for the past ten years, and has had a considerable correspondence with her for the past four years concerning the problems of cerebral palsy. The author owes a great deal of his knowledge of the "non-mechanics" of cerebral palsy to Miss McKibben, and most of her personal observations have been verified clinically. Miss McKibben has not studied the literature on stuttering, and the parallels of her observations on cerebral palsy are, therefore, not colored by her own knowledge of the findings with regard to stuttering on these points. It is of interest in this connection that Carlson (**1**), also a spastic, has commented specifically on certain similarities between the psychological problems of stutterers and spastics.

Miss McKibben is deeply and sincerely interested in informing the professional field that a satisfactory regime of work for the condition can never be developed until the psychological aspects are thoroughly known. Her objective in writing the article mentioned above and in permitting this article to be written is to bring her work and observations to a wider circle of scholarly and scientific investigation.

The following quotations from Miss Kibben's correspondence have been edited only by deletion of non-contributive material. The reader who is scientifically trained will note that Miss McKibben is unaware of the technical terminology concerning cerebral palsy, and for this reason her conceptions of the condition are even more obviously uncolored by previous reporting.

A quotation from a letter of February 14, 1941, will serve as a good introduction to Miss McKibben's basic philosophy: "I live a normal life in spite of the darn thing—won my education, retain my own home with service, manage my own business, and otherwise do what others say is impossible until they see me do it. In other words, I remain a perfectly normal person with personal worth, and to me the spastic condition and situation . . . . . is a buggy jail into which I was put before I was old enough to know it, and out of which I am still studying my way of escape."

From the same letter: "The spastic is a perfectly normal person. Hence the false social situation imposed on him on account of the physical condition—others' views of it—causes him mental suffering, this suffering increases the jumping of nerves and contracting of muscles." One has merely to substitute the word stutterer in this paragraph to have a summary of much of the literature dealing with the problem of stuttering.

The social situations faced by spastics, and the effect of these problems upon the condition, apparently are very similar to the situation found in stuttering, with only the natural differences to be expected because of the severity of the symptoms of cerebral palsy. For example, in Wedberg's autobiography, the following statement is found: "I finally fell a victim to claustrophobia, the terrorizing fear of strangling in dark or closed places. Many times I climbed ten flights of stairs to avoid thirty seconds in an elevator, and often I ran from a closed room or dark theater to get a full breath of fresh air. Once I almost fainted when traffic held up my car for less than a minute in a dark tunnel." (**4**).

Let Miss McKibben demonstrate the mechanics of the development of this sort of thing: (From a letter dated October 29, 1939): "This tower . . . in which the spastic is confined is the false and hideous conceptions of him which his physical condition invites. It fills him with intense fear as to what others are going to assume the liberty to do with him, fear in regard to the restrictions placed on his life's activities, by the snapshot and erroneous views of others; worry lest he fail in his efforts to progress, regardless of strong opposition, and worry and fear as to whether or not he can master his barriers to progress, and so defeat Mr. Social Ostracism."

The peculiar phenomenon in stuttering known as "false fluency" (Van Riper), or "cycles," that is, irregular phases of freedom from stuttering, and, on the other hand, periods of increase in the severity of stuttering, has puzzled all theorists in

the etiology of stuttering. It has not been successfully treated by any of the so-called somatic school, or by any of the so-called semantic school, or by the psychiatric and psychological schools. In response to a query on this matter relative to cerebral palsy, Miss McKibben replied as follows on February 25, 1941: "Every human being feels better at times than at others, and so is able to accomplish more . . . In daily experience, however, there are a great many social factors—various concepts as to the spastic's place in life, if any at all—which so frightens and worries the spastic as to whether he can overcome them and so progress regardless of them, that his nerves jump the more and by jumping interfere with one's motor power. One has more motor power when not under this kind of pressure because then his muscles are more relaxed."

In reply to a question as to whether there were improvements in Miss McKibben's condition to which she could ascribe certain definite causes, she gave four very interesting examples:

1. At one time in her past she was forced to go to court in order to defend her right to live her own life and manage her own affairs. "I forgot I was in the spastic condition. I thought of myself as being the mental equal of my opponent and as having the mental ability to fight for the preservation of my personal rights as a human being and as a citizen of the U.S.A. So determined was I to win my day that my nerves were as calm as they ever were at any time, and so my motor power seemed more at my command than usual."

2. "This same physical improvement is always present when I am very angry. . . . The madder I am, the better I walk, talk, type, compose. . . "

3. A complex of teasing, joking, being late to class at college, plus the encouraging remarks of an instructor concerning a theme so occupied her mind one morning that she walked across the floor, picked up her school books, and started to school without a thought of the muscular effort involved.

4. Once when she was under a general anesthetic at the hospital and just coming out from it after the removal of teeth, Dr. Pusitz walked in and said he had just wrecked his car. "My fear that he had so many more important things than I to hold his attention and so prevent him from pausing to understand my poor speech left me, and so he had no trouble understanding what I said to him. . . For the past two and a half years I have consulted with him very often about my work in his clinic, and he had shown me much consideration, but until the other morning I have had to type what I would say to him."

Similar experiences are related by stutterers in almost every history taken in a speech clinic. The chief difference is apparently in the location and extent of the motor difficulty rather than in any essential difference in quality.

In recent years a large number of investigations regarding stuttering have developed as a result of the stimulus given the general field by the applications to it of general semantics, chiefly by Dr. Wendell Johnson, and the students trained by him.

In the 1939 convention of the American Speech Correction Association held at Cleveland, Dr. Johnson propounded a rather interesting and basic semantic question: "Are there stutterers, or is there stuttering?" Dr. Johnson questioned the validity of stuttering as a true entity parallel to measles, for example. In 1941, the tenor of Miss McKibben's correspondence developed an interesting parallel with this application of general semantics, and the present author asked her the same question in regard to cerebral palsy: "Are there spastics, or is there spasticity?" together with an explanation of the meaning of the question.

February 14, 1941, she replied as follows: "There are no such things as spastics." In the same letter she stated that there is a condition called the spastic *condition*, and a situation called the spastic *situation*, which are super-imposed upon a perfectly normal individual. Further, on October 27, 1941: "It has already been agreed that many spastics have sound minds, and that their general health is perfect. Anyone who has a good mind is said to have a soul. Don't a good mind, a soul, and good physical health constitute a perfect individual?" Miss McKibben goes further than Dr. Johnson, and not only denies spasticity as such, but also spastics.

The hypothesis laid down by Dr. Johnson and others, and found for the most part with its supporting evidence in the series of papers published in the *Journal of Speech Disorders*, and, again for the most part, entitled "Studies in the Psychology of Stuttering: I to XVII (to date)," assumes that stuttering, as such, develops as a result of a diagnosis of stuttering by the child, the parents, the teachers or other persons in the environment. The diagnosis is based on a faulty interpretation of certain normal iterations in the speech of the child.

Miss McKibben has developed an interesting series of parallels to this hypothesis: February 25, 1941. "Look back a bit further and you will find that only recently have parents of spastic children known one thing about each other's existence. Each set of parents have considered their child to be almost, if not altogether, the only case of the kind, and have had the secret conviction that the spastic condition was the proof that the sins of the fathers are visited upon the children unto the third and fourth generations. . . ." Further, referring to Guy de Maupassant's "Fecundity," as an example of semantic mal-assumptions, she states: "Such unhealthy concepts as it sets forth are very like those of others regarding the spastic, and . . . his fear of not being able to free himself of them—not being able to upset them by evidencing his personal worth—is the direct cause of his poor speech, or no speech—contracted tongue."

February 14, 1941: "The spastic *situation* is the social position which the false concepts of other people as to the spastic patient would inflict upon him." November 21, 1942: "The spastic—the physical—condition so belies the perfect individuality of the intelligent patient as to cause others to hold abnormal concepts of him. . . To illustrate: Sister Maud had freckles all over her face, but I did not have a single one. Nobody was so dumb as to think freckles were Maud, or that she was freckles . . . Mother never told folks all about Maud's freckles. She only talked to Maud herself. . . Then why did mother talk about spasticity as if it were the most important and biggest part of me? Why, it was not my own self at all. . . The difference was that Maud believed that if she washed her face in watermelon juice her freckles would go away; whereas I did not believe spasticity could be made to go off and leave me alone. . . This side of the problem as above described excited intense fear and worry, and thus increased the contraction of muscles and jumping of nerves from time to time. . ." Miss McKibben states further in this connection that physical treatment can never have the fullest success until the psychological aspects of work with cerebral palsy are intelligently handled.

Finally, to close this series of samples from Miss McKibben's correspondence: December 19, 1942: (Speaking of the spastic situation in much the same terms as she has used in her article in this issue of the *Journal*) "Idle talk which belittles the personal worth of the spastic—idle talk running into hateful criticism; bitter criticism advancing into social ostracism; social ostracism attempting to stamp out of sight the personal worth of the spastic, rob him of his rights as a human being, and of his every opportunity to progress. . . The spastic situation thus described is not "of course, the cause of the spastic condition" (referring to a letter of the author's). . . but it has exactly the same effect upon this physical condition (as) a quart of castor oil forced down the throat of a patient who has a bad case of appendicitis."

These introspections and conclusions of Miss McKibben are worthy of note, since they throw light on a very important aspect of work with cerebral palsy which has been totally neglected in the literature. It is to be hoped that more thorough study can be made of the spastic *situation*, since it is evident that neglect of this phase of cerebral palsy is responsible for some part, if not a great part, of the slowness of progress in these cases. Also many of the symptoms observed may owe their severity, not to the brain lesion involved, but to the spastic situation. Miss McKibben's contribution is of greater value when it is considered that she is not conversant with the literature of the field, and reports without bias, and with considerable insight and intelligence, the situation faced by almost all individuals with cerebral palsy from birth through adulthood. To summarize Miss McKibben's work: She believes that one of the greatest problems in

cerebral palsy is the *spastic situation*, which is the situation faced by the spastic in establishing himself as a worthy and intact individuality. The problem is superficially "mental," but the situation is the more serious when it is considered that the environmental pressures, somewhat as in the case of stuttering, bring about an increase in the physical signs of the condition, as well as a fixation of the condition.

Miss McKibben's findings are based for the most part on her observations of herself, and on her observations of other spastic individuals, but it seems apparent from the author's clinical experience that her statements are in general verifiable by reference to other cases. It is essential, therefore, that a great deal of attention be paid to removing the undesirable features of the *spastic situation* in any work with cases of cerebral palsy.

It is intriguing to the etiologically minded person to observe the large amount of psychological similarity between this aspect of the picture of cerebral palsy with definite brain lesions, and that of stuttering, in which no definite lesions have ever been reported. Rutherford (**3**), in her study of children with cerebral palsy at the Dowling School in Minneapolis reported that there were approximately twice as many dysphemics among these children as among the defective speech classes of the Minneapolis public schools. This is also an interesting finding, although Johnson[1] has suggested that true "stuttering" may not appear more often in these cases; the "stuttering" that is noted may be of a physiological type directly caused by the condition.

There is, however, no present evidence to support a theory of brain lesions in relation to stuttering, except inferential evidence, which is, of course, only of speculative value.

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A CARDIOVASCULAR AND METABOLIC STUDY OF STUTTERERS AND NON-STUTTERERS[1,2]

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I. Introduction

One of the more recently suggested hypotheses concerning stuttering is that it has a "sex-linked, neuro-physiological, metabolic etiology" which shows itself in the form of abnormally rapid heart rate and abnormally small rhythmic changes in heart rate (sinus arrhythmia) in the stutterer during silence (Palmer and Gillette, **9**, **10**). The disorder is thought to be sex-linked because of (among other considerations too complex to generalize) an experimentally observed "cardiac masculinity" in female stutterers which shows itself in heart rates and sinus arrhythmia characteristics more similar to male stutterers' cardiac characteristics than to those of female normal speakers. This hypothesis and these observations came out of Palmer and Gillette's studies of heart rate and sinus arrhythmia in stutterers and non-stutterers *during silence*, which were undertaken on the assumption that the heart's action during silence, in terms of its rate and changes in rate, provides a valid index of constitutional difference, if such there be, between stutterers and normal speakers.

Because of the importance of their conclusions, to be reviewed presently, Palmer and Gillette's studies warrant replication. This is the ultimate objective of the present study. However, something more than simple replication is proposed here, inasmuch as it is possible to introduce certain improvements in the experimental design of these studies. These changes in experimental design come chiefly from the author's feeling that Palmer and Gillette were in error in (1) the nature of their control over extraneous factors related to heart rate, such as body surface and time of recording; and (2) their choice of the single heart beat and the single respiratory phase as their sampling units in their statistical tests, rather than the individual subject, which latter choice would seem to be dictated by statistical logic. Furthermore, since heart rate is known to be influenced by emotional excitement, etc., there seems to be ground for objection to their assumption as to the independence of the heart during silence

[1] This paper constitutes, in substantial part, a doctoral dissertation written under the supervision of Wendell Johnson at the State University of Iowa, 1939-41. Grateful acknowledgments are made to Dr. C. I. Miller, Director of the Department of Student Health, Mrs. Muriel Ward, metabolism technician at the University Hospital, Dr. W. W. Tuttle, Professor of Physiology, and Professor E. F. Lindquist of the College of Education, all of the University of Iowa, for their invaluable counsel and assistance.

[2] Read, in part, before the American Speech Correction Association convention in Detroit, December, 1941.

of behavioral factors which, presumably, would operate in any experimental situation to differentiate stutterers and normal speakers, whether speaking was involved or not.

Improvements in experimental design intended to meet these criticisms, and interpretations which take into account the probable influence of behavioral differentia between the two groups are provided in the present study. In addition, data for two other experimental variables, blood pressure and basal metabolic rate, which are related to heart rate, were secured because it was felt that such data would contribute to a more adequate test of the hypothesis that stuttering has a sex-linked, neuro-physiological, metabolic etiology.

II. Problem

Though the ultimate purpose of the study, as explained above, is validative, its immediate purpose is to compare measures of heart rate, sinus arrhythmia, blood pressure, and basal metabolic rate obtained from a group of young adult male and female stutterers, during silence, with similar measures obtained from a group of normal speakers matched with the stutterers for age, sex, and body surface. The null hypothesis[3] is tested in the case of each of these four experimental variables by the application to the data of a statistical test of the significance of a difference between the means of related measures in a small sample.[4]

III. Subjects

Twenty-nine stutterers participated in this study, four of whom were women. Twenty-six of the stutterers were undergraduates receiving remedial speech instruction at the State University of Iowa. The age range of the men in the group was 17 to 34 years, with the mean age at 19.6, and the median age at 22.3 years. The age range of the women in the group was 18 to 31 years, with the mean age at 23.5 years. Each stutterer was matched with a control for age to the nearest birthday, for sex, and, within practical limits for body surface.[5] The experimental subjects in this study were, as a group, quite inured to the laboratory situation, whereas the controls as a group were comparatively naive.

Two members of the speech clinic staff at the University, and as many other observers as were familiar with the stutterer's problems, were asked to rank each stutterer with whose case they were familiar as a "mild," "moderate," or "severe" stutterer. At least three observers gave a rank to each stutterer. The rankings enabled the experimenter to class eight subjects as "severe" stutterers, one of whom was a woman. The point should be stressed that this step in the experiment was intended to be exploratory, and the procedure used is to be evaluated in terms of the information forthcoming from

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[3] The hypothesis that the true difference is zero.

[4] See E. F. Lindquist, *Statistical Analysis in Educational Research*, New York: Houghton-Mifflin, 1940, pp. 58-59.

[5] Complete data on matching are given in the Appendix of the manuscript copy of this study on file in the library of the State University of Iowa.

the sub-group of "severe" stutterers it served to discriminate from the primary group. As it turned out, the "severe" stutterers thus identified did present tendencies in some cases which may be regarded as leads for future experimentation.

IV. Heart Rate

Review of Previous Research. Fletcher (**3**, 1914), Travis, Tuttle, and Cowan (**12**, 1936), and Palmer and Gillette (**9**, 1938) have reported studies on heart rate in stutterers.

Fletcher, in his study of the change in heart rate which stutterers undergo during a speaking performance, secured measures of heart rate just before the speaking interval began, at the beginning of the speaking interval, and at the close of the interval. The data thus obtained were as follows: pulse rate averages for the group for the first period, 90.2 beats per minute, for the second period, 99.8, and for the third period, 98.6. Fletcher concluded that the "average pulse rate is above normal in the period anticipatory of speaking" and that "in general, under those conditions that are calculated to produce stuttering, the speech of the stutterer is attended by an abnormal acceleration of the pulse rate." He regarded these phenomena as co-incident symptoms of stuttering, and was interested in them as an indication of the emotional consequences of stuttering for the subject.

The results of Travis, Tuttle and Cowan's study of heart action in stutterers during silence and oral reading were confirmatory of Fletcher's study of heart rate, stutterers having faster rates before a speaking performance and during one than normal speakers. This fact, together with the presence of sundry abnormal cardiac phenomena which included sinus arrhythmia peculiarities among the stutterers to be mentioned later, was attributed by the authors to the emotional concomitants of stuttering and to the "varied and severe respiratory abnormalities symptomatic of stuttering."

Palmer (**8**, 1937) in a study of the relation between the cardiac cycle and energy distributions in speech, found only "very rough" correspondence in this regard between the tendencies of normal speakers and those of stutterers. Feeling that the discrepancies indicated that stuttering was a "phenomenon of neuro-physiological order rather than a so-called volitional or emotional disturbance," he proposed to test this hypothesis with further studies of cardiac phenomena in stutterers. Since the present study grew out of the present writer's interest in these later studies, they are reviewed in more detail than those hitherto mentioned.

In the first of these studies the sex differences in heart rate of stutterers and normal speakers were investigated (**9**). Twenty-four stutterers, matched for age and sex with twenty-eight normal speakers, with an age range from 9 to 26 years, participated in the study. Most of the subjects in both groups were naive in the laboratory situation. Heart rate data were secured from kymograph records of the radial pulse of each subject during silence two hours after a meal.

The records were analyzed by computing the rate for each of 13,325 beats, which data "were then tabulated in frequency tables, one for stutterers and one for normals, and the mean and standard deviation were then computed for each distribution."[6] These group distributions were later broken down into age levels and sex groups, and the statistics mentioned re-computed for each sub-group. In all these computations, it should be noted, the unit of sampling was the heart beat, whereas the unit of sampling in the study of Travis, Tuttle and Cowan was the individual subject. The validity of the error estimates used in this study hinges on the appropriateness of this choice of a sampling unit, a point which will be further discussed at the conclusion of this review.

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[6] Dr. Palmer, in a letter to the author.

The differences observed between the obtained means and standard deviations for the two groups and the various sub-groups were then evaluated by large sample tests of the significance of a difference between the means and standard deviations of independent measures. Their main findings were (1) all stutterers had faster heart rates than their controls, (2) the male stutterers had significantly higher rates than the female stutterers, whereas the male controls had significantly lower heart rates than the female controls, (3) the male stutterers had significantly more irregular heart action than their controls, while the female stutterers had less irregular heart action than all the controls. On the strength of these findings they concluded that there is a sex-linked, neuro-physiological, metabolic mechanism for stuttering.

The present writer was reluctant to accept either these findings or the conclusion for the following reasons: (1) since heart rate is increased by emotional excitement and the subjects were naive, it is reasonable to attribute the higher heart rates of the stutterers to more emotional excitement on their part in the laboratory situation; (2) the use of the single heart beat as the sampling unit does not seem to be a valid procedure because the heart beats from one subject constitute an intact, relatively homogeneous sub-group which would require the experimenter to regard the individual subject as the sampling unit; (3) the use of heart beats as sampling units made the N's in the study very large and thus made for under-estimated error terms in the significance test, hence all of the significant differences found in the study may be due to the fact that invalid error estimates were employed;[7] (4) because heart rate varies inversely with body surface (**2**, p. 329), the failure to control this factor introduces a source of error which could be quite serious with samples (of subjects) as small as were used here.

Apparatus and Procedure. This portion of the study was designed to provide data on the heart rates of the subjects in the morning under basal conditions,[8] and in the afternoon during silence. Three sets of heart rate data were secured by three operators in the morning, each operator using digital palpation of the pulse to make his reading, and a fourth set was secured from electocardiograms made in the afternoon.

The first pulse reading was taken by Ritzman for all of the male subjects *in the morning in the subject's bedroom just before arising.* This procedure was repeated once with each of the subjects in order to provide second measures for the computation of a reliability correlation coefficient. The next two sets of pulse rate data were secured by Mrs. Muriel Ward, metabolism technician at the University Hospital, and Dr. C. I. Miller, Director of the Student Health Department, during the time the basal metabolic rate and blood pressure measurements were being made. Second pulse rates were secured for twelve subjects by Dr. Miller and for twenty subjects by Mrs. Ward. In every case the heart rate data from these operators were secured from subjects who had come *directly from home to the hospital without breakfast.*

Using the first pulse rate secured by each of the two latter operators, and the mean of the two pulse rates secured by Ritzman, *t*'s were then computed in testing the differences between the groups as a whole, and their various sub-divisions. Raw score reliability correlation coefficients were run for each operator.

The fourth set of data was secured from electrocardiograms (Figure 1) made for each subject in the cardiographic laboratory of the Physiology Department of the University. Dr. W. W. Tuttle, Professor of Physiology at

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[7] For the theoretical basis of these criticisms and an exposition of small sample theory see E. F. Lindquist, *op. cit.*, pp. 18-24, 48-75.

[8] As used in this context, basal conditions are those in which the subject "though awake, is as nearly as possible at complete muscular and mental rest and in the post-absorptive state" (**2**, p. 854). The post-absorptive state occurs 12 to 14 hours after a meal, when, presumably, digestive processes are quiescent.

the University, operated the electrocardiograph for all recordings. A Cambridge electrocardiograph was used, together with an attached pneumatic system for photographing the respiratory movements on the cardiogram. The latter apparatus is described later in connection with the study of sinus arrhythmia. The usual procedure for making cardiograms was followed. Recordings were made in a darkened room. The subject sat facing away from the apparatus. He was instructed that no speaking was to be required of him, and was asked to rest as quietly and comfortably as possible during the recording. Each recording was accomplished in less than five minutes. Samples of leads I, II, and III were taken in each recording. The mean length of the records was 94 heart beats, with a range of 34 to 209. Since the mean pulse rate for all subjects was 81.5 beats per minute, the length of the mean record was slightly more than one minute. The heart rate for each subject was calculated from the cardiograms and the differences between the groups as a whole and their various sub-divisions were then evaluated by means of the *t*-test for related measures.

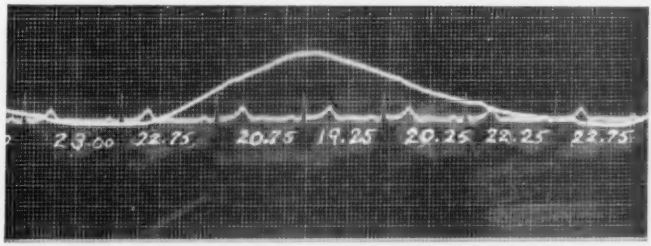

FIGURE 1. Portion of an electrocardiogram obtained in this study. The top line represents the respiratory movements of the subject, inspiration occurring on the upward swing of the curve and expiration on the downward swing. The lower line is the heart line. The straight vertical lines are timemarkers, the space between each line representing one twenty-fifth of a second of elapsed time on the film. The numbers written on the film are placed directly beneath the heart beat to which they refer. Each number is the period-value of the heartbeat represented on the heart line directly above, and is given in the number of twenty-fifths of a second included between two consecutive analogous points on the heart curve. Note that these period values become smaller (meaning the heart is beating faster) during inspiration, and larger (meaning the heart is beating slower) during expiration. This is the sinus arrhythmia phenomenon.

Reliability of the Palpation Method. Reliability correlation coefficients for the three operators in this study using the palpation method of determining heart rate ranged from .77 to .82. These coefficients are high for as unstable a variable as heart rate, and indicate that *the conditions under which the data for the study were secured made for relative stability of heart rate, an important feature of the design of the present experiment.* As to the accuracy of the palpation method, correlation ratios for the data from the different operators ranged from .61 to .89. The higher coefficient here resulted from measures made by two operators on the same subject on the same day. These coefficients, it is believed, support the assumption that the palpation method is sufficiently accurate for the purposes of this study.

Results. The results of comparisons of mean heart rate for the experimental and control groups and the various sub-divisions thereof are presented in Tables I, II, III, and IV. The groups whose mean differences were evaluated were as follows: all stut-

terrers and their controls, and "severe" stutterers and their controls. No significant differences were found on any comparison for any observer, nor for the heart rates secured from the electrocardiograms. These results do not support the hypothesis that stutterers differ from non-stutterers in mean heart rate during silence.

TABLE I. Heart Rate Data: Ward

	N (Pairs)	Mean Pulse	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men				
Exper.	24	65.0	−1.7	2.99	.57	23	60%
Control		66.7					
			Women				
Exper.	3	66.0	−4	13.05	.31	2	80%
Control		70.0					
			Combined Groups				
Exper.	27	65.22	−1.59	2.92	.544	26	60%
Control		66.81					
			Severe Stutterers				
Exper.	8	62.4	−10.5	5.15	2.039	7	10%
Control		72.9					

*t is roughly equivalent to the better-known "critical ratio." However, the significance of any given t depends entirely on its "degrees of freedom" ("d.f." in the table) which means, in this study, the size of the sample less one. The formulae for computing the t's used in this study and the tables used for determining the significance level of the t's may be found in E. F. Lindquist, *Statistical Analysis in Educational Research*, New York: Houghton Mifflin, 1940, pp. 53-54, 59.

The mean differences between the groups are, with one exception, all quite small. However, the "severe" stutterers present a mean pulse rate in the Ward data which is considerably *lower* than that of their controls. In this connection it should be noted that in the Ritzman pulse rates this difference is not at all large, though in the same direction. The discrepancy seems to be due to the absence of the data for the female "severe" stutterer and her control from the computations in the latter table. The differences for this pair were 23 and 26 beats per minute, in the Ward and Miller data respectively, with the stutterer having the *lower* rate in each case.[9]

[9]The "severe" stutterers' results are not presented with the Miller data because only three pairs of subjects had complete data, as obtained by Dr. Miller.

Note that the obtained difference for the "severe" stutterers in this study is *in the opposite direction* from those reported by Fletcher, Travis *et al*, and Palmer and Gillette. This fact, in

TABLE II. Heart Rate Data: Miller

	N (Pairs)	Mean Pulse	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men				
Exper.	11	73.8	+1.6	5.97	.27	10	80%
Control		72.2					
			Women				
Exper.	4	78.5	+4.5	11.30	.40	3	80%
Control		74.0					
			Combined Groups				
Exper.	15	75.00	+2.40	1.667	1.440	14	20%
Control		72.66					

*See footnote to Table I.

addition to the very small obtained differences between the other sub-groups, provides no support for Palmer and Gillette's hypothesized physiological mechanism which manifests itself in a relation between stuttering and higher heart rate.

TABLE III. Heart Rate Data: Ritzman

	N (Pairs)	Mean Pulse	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men				
Exper.	24	59.7	+1.3	2.11	.61	23	60%
Control		58.4					
			Severe Stutterers				
Exper.	7	58.7	−2.5	4.93	.52	6	70%
Control		61.2					

*See footnote to Table I.

V. Sinus Arrhythmia

Definition of Sinus Arrhythmia. Sinus arrhythmia is a cardiac phenomenon characterized by acceleration of heart rate during or toward the end

of inspiration and slowing of the heart rate during or toward the end of expiration (Figure 1). Though it has been defined in quantitative terms as a rhythm in which the difference between the longest and shortest pulse period within a given respiratory phase was 0.1 second or more (Krumbhar and Jenks, 1916) this definition, according to the authors, is "purely arbitrary." The term is used generally to cover gradual variations of any measurable degree in the heart rate associated with respiratory movements.

TABLE IV. Heart Rate Data: Electrocardiograms

	N (Pairs)	Mean Pulse	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men				
Exper.	23	18.84(81)*	+ .35	.81	.38	22	80%
Control		19.19(80)					
			Men and Women				
Exper.	27	82	+1.33	3.12	.42	26	70%
Control		81					
			Women				
Exper.	4	17.36(87)*	− .04	2.059	.02	3	90%
Control		17.32(88)					

*these t's were computed, for convenience, with the data in period values. The units here are twenty-fifths of a second. The value of the mean periods in beats per minute are given in parentheses for the men and women, respectively, and only beats per minute values are given for the combined group.

The Determinants of Sinus Arrthythmia. It is important for the present study that two facts be kept in mind. The first is that sinus arrhythmia is an entirely normal physiological phenomenon. It has been seen to occur in 212 out of 222 normal children (95 per cent), if the criterion is simply a measurable variation in pulse period, or in 67 per cent of the cases if the criterion is a variation of 0.1 second or more (Lincoln and Nicolson, 1928). There is no point theoretically in distinguishing between the groups which presented variations which fell below 0.1 second and those which satisfied this criterion. Both presented sinus arrhythmia, the difference being one of degree.

The second fact is that the mechanism for sinus arrhythmia is not a relevant question in the present study, whether that mechanism be the mechanical stimulation of the vagus during respiratory movements, the irradiations of the effects of the respiratory center in the medulla on the cardio-inhibitory center, or the direct action of changes in somatic circulation upon the cardio-inhibitory center,[10] to which latter possibility Palmer and Gillette attach much significance in interpreting their data. The question of the mechanism for sinus arrhythmia is at one remove from the level of physiological phenomena with which we are concerned here, for, as will be seen, sinus arrhythmia varies as some function of the activity of the individual in which it is observed.

Besides being affected by deep breathing (Best and Taylor), swallowing (Bass), and emotional disturbances (Bass, Lamson), sinus arrhythmia and

[10] The literature on the mechanism for sinus arrhythmia is reviewed in an article by J. F. and C. Heymans, "Sur le Mecanisme de l'Arhythmie Cardiaque Respiratoire," *Compt. Rend. Soc. Biol.*, **96**, 1927, p. 716.

heart rate are inversely related. Wiggers (**13**), Bass (**1**), and Lincoln and Nicolson (**7**), have remarked on this relation between the two variables. It was convenient to quantify this relation in the present investigation by running a correlation between the data for mean change in length of heart beat and heart rate, and between the regularity of change in length of beat and heart rate, all of which data were secured from the same cardiogram for each subject. The results are presented in Tables V and VI. *A significant negative*

TABLE V. Correlation Between Regularity of Change in Heart Rate (Standard Deviation) and Heart Rate

	N	Correlation	Significance Level
Combined Groups	55	−.52	1%
Experimental	27	−.50	1%
Control	28	−.56	1%

correlation between both mean amount of change and regularity of change and heart rate was found. In other words, sinus arrhythmia and heart rate are concomitant variables. It is to be expected, then, that any activity or psychological state which causes an acceleration of heart rate will tend to eliminate or diminish the sinus arrhythmia originally present. One is compelled by these considerations to look first for the explanation of differences between the groups in the present study with respect to quantitative and qualitative characteristics of sinus arrhythmia, not in assumed deviations of the stutterer's organism from the normal, but among the functional determinants of heart rate which might have been operating in the experimental situation.

TABLE VI. Correlation Between Sinus Arrhythmia and Heart Rate

	N	r	Significance Level
Combined Groups	55	−.587	1%
Experimental	27	−.526	1%
Control	28	−.647	1%

Review of Previous Research. Travis, Tuttle, and Cowan (**12**), in the study mentioned previously, also investigated the sinus arrhythmia phenomenon in their subjects during silence and oral reading. Besides finding that it was present in every subject's cardiogram, they found that expiratory heart rate was more retarded during speaking in both stutterers and controls than during silence, and that variability in heart beat length was increased during speaking for both groups. The differences between the two groups on these two variables were not significant. Finally, they observed reversals of the normal sinus arrhythmia respiratory pattern in two "severe" stutterers during the period of silence before oral reading occurred. They attributed the observed increases in variability of heart rate during speaking, and the greater retardation of expiratory heart rate during speaking, to the speech activity *per se*, but disclaimed an explanation of the reversals in sinus arrhythmia pattern noted.

The data for Palmer and Gillette's study of sinus arrhythmia in stutterers and non-stutterers (**10**, 1939) were secured from kymograph records including the radial pulse and breathing curves of twenty-one stutterers and twenty-four normal speakers whose age range was nine to twenty-six years. Each

stutterer was matched for age and sex with at least one control. After each pulse period had been measured, all of the beats in each respiratory phase (excluding the pause) were classified as showing an increase, a decrease, no change, or both an increase and a decrease in the lengths of their periods. The number of the respiratory phases falling in each classification was then converted into a percentage, and comparisons were made between the two groups and between the sexes for inspiration and expiration. The comparisons were made by computing first the standard error of the control group percentage and, finally, the ratio of the difference between the two percentages being compared to the standard error of the control group percentage, a ratio of 3.00 or more being regarded as significant.

There would appear to be two objections to the methods these authors employ in the analysis of these data. In the first place, they have used as their sampling unit the respiratory phase, whereas the number of observations which the data represent is equal, in this writer's opinion, to the number of subjects. In dealing with samples of respiratory phases from given individuals they are dealing with intact, homogeneous groups. Because of this fact they are constrained by statistical logic to regard the individual as the unit of sampling. The correct unit of sampling, therefore, is the individual subject, and, since the number is small, small sample techniques for evaluating a difference should be used. In the second place, it is inconsistent, in this writer's opinion, to assume that one of the values involved in the test of a difference between two means is the true mean of the population involved, as these authors have done in using the standard error of the mean percentages for the control group to evaluate the difference between the control and experimental groups.

All of the *t*'s, then, reported in Palmer and Gillette's study of sinus arrhythmia, are, in the present writer's opinion, derived through statistical procedures of questionable validity. Setting aside these criticisms for the moment, their findings can be summarized with the statement that their stutterers presented significant differences, qualitative and quantitative, from their controls in sinus arrhythmia, and that the data for their female stutterers resembled those for their male stutterers more than they did those for their female controls. These findings led Palmer and Gillette to conclude that stutterers have fundamental physiological tendencies which are directly opposite to those of normal speakers so far as the mechanism of sinus arrhythmia is concerened, and finally, that "stuttering is a sex-linked mechanism and the mechanism is of neuro-physiological order."

Apparatus and Procedure. The data for the present study were obtained from electrocardiograms for each stutterer and a control. A record of the respiratory movements of the subject was obtained on the cardiogram (Figure 1) by attaching to the electrocardiograph camera an apparatus consisting of a wire stylus and tambour with a very thin rubber membrane connected in a pneumatic system to a Sumner pneumograph. The stylus lag was checked for four different membranes which were used in the study and was found not to exceed one twenty-fifth of a second, positive or negative. Corrections for the lag factor indicated by these checks were made. The cardiograms were then analyzed by classifying each inspiratory phase and each expiratory phase as showing an increase, a decrease, no change, or both increase and decrease in the rate of the heart beats occurring during its duration. The procedure in this study was to place all beats in the phase in which their auricular contraction occurred.

Several additional data were then secured from the period values of the first fifty heart beat curves in half of the cardiograms of each group (picked at random), and the last fifty heart beat curves in the remaining half of the cardiograms in the two groups. These data were: mean amount of change in heart beat duration, and the standard deviation of each cardiogram's distribution of heart beat periods. These values were then summed for each group and mean group values determined, the differences between which were then evaluated by the *t*-test of the significance of a difference between the means of related measures in small samples.

Qualitative Analysis of Sinus Arrhythmia. The reliability of the method used for analyzing the cardiograms qualitatively was checked by the following procedure. Two months after the first readings had been made, ten cardiograms, picked at random with the help of a table of random numbers, were again read, and the individual and mean percentages determined as in the first reading. The mean differences between the first and second readings were computed and a *t*-test for related measures was run. The mean difference was .0025 per cent and the standard error of the difference was 2.08 per cent. The standard error of the difference provides an estimate of the reliability of the mean percentages used in the study, and is smaller than most of the differences dealt with in the comparisons between the experimental and control groups. These data indicate that the classificatory method used in this study is sufficiently reliable to permit meaningful comparisons to be made between the experimental and control groups.

TABLE VII. Qualitative Analysis of Sinus Arrhythmia During Inspiration

	N	Increase Mean Percent		Decrease Mean Percent		Inc.-Dec. Mean Percent		No Change Mean Percent	
			Mean				Mean		
Male Stut.	23	72.45	Diff.	5.42		19.64	Diff.	2.51	
SE Mean		2.41	−3.24	4.66		3.98	−4.15	1.15	
Male Norm.	24	75.69	SE Diff.	4.86		15.49	SE Diff.	3.70	
SE Mean		4.26	4.89	1.65		2.98	4.97	1.34	
			Mean						Mean
Female Stut.	4	70.30	Diff.	3.89		13.45		12.36	Diff.
SE Mean		2.90	−11.93	1.03		6.04		7.87	−9.03
Female Nor.	4	82.23	SE Diff.	3.33		11.10		3.33	SE Dif.
SE Mean		8.08	8.57	3.33		6.36		3.33	8.54
			Mean				Mean		
All Stut.	27	72.13	Diff.	5.19		18.72	Diff.	3.96	
SE Mean		2.11	−4.49	4.23		3.52	−3.86	.86	
All Norm.	28	76.62	SE Diff.	4.64		14.86	SE Diff.	3.64	
SE Mean		3.80	4.35	1.47		2.68	4.36	1.22	
Sev. Stut.*	8	74.3	Mean Diff. −4.9	7.4	Mean Diff. −4.3	16.0	Mean Diff. −4.1	2.5	Mean Diff. −4.9
Controls	8	69.4	SE Diff. 10+	3.1	SE Diff. 3.08 t=1.396 (20%)**	20.1	SE Diff. 7+	7.4	SE Diff. 3.53 t=1.388 (20%)**

*The standard errors of the means for these groups are not given because the standard errors of the differences were, for convenience, computed directly.
**These are the significance levels for the *t*'s given.

The results of qualitative analysis of the sinus arrhythmia data are presented in Tables VII and VIII. No significant differences between stutterers and their controls were found. The "severe" stutterers presented a tendency toward more reversals of the sinus arrhythmia pattern of decrease in heart rate during

expiration, the t for the difference ranking at the 10 per cent level. Examination of the data for trends revealed that the male stutterers had a tendency toward more irregularity than their controls on inspiration, while the female stutterers tended toward less irregularity than their controls on inspiration. Similar tendencies were observed in the data for expiration.

TABLE VIII. Qualitative analysis of Sinus Arrhythmia During Expiration

	N	Increase Mean Percent		Decrease Mean Percent		Inc.-Dec. Mean Percent		No Change Mean Percent	
Male Stut.	23	10.50		63.87	Mean Diff.	20.27		4.93	
SE Mean		4.46		1.46	−4.80	4.35		0.88	
Male Norm.	24	7.07		68.87	SE Diff.	17.45		5.96	
SE Mean		1.83		4.44	4.67	3.74		1.87	
							Mean		Mean
Female Stut.	4	4.95		72.70		11.84	Diff.	10.51	Diff.
SE Mean		12.88		3.23		4.61	−11.84	7.87	−9.04
Female Nor.	4	5.00		69.95		23.58	SE Diff.	1.47	SE Diff.
SE Mean		5.00		11.30		9.72	10.75	1.48	8.00
All stut.	27	9.68		65.18		19.02		5.75	
SE Mean		4.15		1.31		3.77		1.88	
All Norm.	28	6.77		68.85		18.32		5.32	
SE Mean		1.69		4.05		3.45		1.64	
			Mean		Mean		Mean		Mean
Sev. Stut.*	8	13.5	Diff.	63.5	Diff.	18.5	Diff.	4.9	Diff.
			−9.6		2.1		−6.4		2
Controls	8	3.9	SE Diff.	65.6	SE Diff.	24.9	SE Diff.	6.9	SE Diff.
			4.86		10+		7+		3+
			t=1.975 (10%)**						

*The standard errors of the means for these groups are not given because the standard errors of the differences were, for convenience, computed directly.
**Significance level for the t.

Were it not for the fact that these trends are in agreement with analogous data in Palmer and Gillette's study they would not appear to warrant discussion, since they are not significant statistically. They are not, however, regarded by this writer as evidence of the stutterer's physiological aberrance. In the first place, it may well be argued that interpretations here are gratuitous inasmuch as the data by no means dictate a rejection of the null hypothesis. In the second place, if an interpretation were called for, it would seem the more conservative course to assign purely symptomatological significance to the data in view of the evidence already mentioned that sinus arrhythmia varies as a function of behavioral variables. Indeed, since Palmer and Gillette choose to interpret the presence of both accelerations and decelerations of heart rate during a respiratory phase in functional terms,[11] there seems to be little justification for positing

[11] Finding that the heart beat length both increased and decreased during a respiratory phase equally often in the two groups in their qualitative analysis, Palmer and Gillette attribute the phenomenon to "irregularities of the pulse from stimulus, mental excitement, etc." (**10**, p. 135, footnote).

a physiological mechanism to account for the remaining portions of the data from this analysis of sinus arrhythmia.

Mean Amount of Change in Heart Rate. The data for this variable and for regularity of change in heart rate, discussed in the section following, were derived from fifty consecutive heart beat periods occurring either at the beginning or at the end of each of the cardiograms for the subjects. Differences due to the time in the recording when the beats occurred were measured and evaluated by tests of the differences between the statistics obtained from sub-groups, within the experimental and control primary groups, of subjects whose first fifty heart beats had been used and sub-groups of subjects whose last fifty heart beats had been used. No *t*'s ranking above the 25 per cent level were found. The reliability of the sinus arrhythmia data derived from these sub-samples of fifty heart beats is indicated by the reliability of the heart rate estimates derived from them. The mean change in heart rate for all of the subjects when the heart rate is estimated from fifty beats, initial or terminal, rather than from all of the beats, is 0.02 seconds, or about one beat per minute, since the mean heart rate for the combined groups during the recording was 81.5 beats per minute. In view of the evidence presented above that sinus arrhythmia and heart rate are concomitant variables, it is to be concluded that heart beat samples of the size used here yield sufficiently reliable measures on sinus arrhythmia for the purposes of the study.

By mean amount of change in heart rate is meant the mean change which occurred in the length of the heart beat regardless of the direction of the change. This value provides a convenient and direct quantitative index of the over-all sinus arrhythmia effect, and it was found to be an accurate description of the relation between the groups on the data for both increases and decreases in heart beat length. The difference between the mean increases and mean decreases in heart beat length was evaluated in this study for each group by applying the *t*-test for related measures to the distribution of differences obtained by subtracting the mean decrease from the mean increase for each subject. These differences were not significant in either group, indicating that for the subjects in this study the sinus arrhythmia effect is adequately described by taking the mean of the increases and decreases in heart beat length as the index of that effect.

The results from the study of mean amount of change are presented in Table IX. The differences between the experimental and control groups were not significant until the data were broken down into the sex divisions. Whereas on all comparisons the stutterers presented a smaller mean amount of change than their controls, this difference in the case of the female stutterers was more marked, yielding a significance ratio which ranked at the 5 per cent level. As in the case of the previous variable, these

results tend to confirm those of Palmer and Gillette (**10**) who found that their male stutterers resembled their controls as regards mean change in heart rate during both inspiration and expiration, but that their female stutterers presented significantly smaller mean time changes than their controls in both phases of the respiratory cycle.

TABLE IX. Mean Amount of Change in Heart Rate*

	N	Mean Amt. of Change	Mean Diff.	SE Diff.	t**	d.f.	Signif. Level
			Combined Groups				
Exper.	27	.61	−.19	.144	1.319	26	20%
Control		.80					
			Men				
Exper.	23	.8074	+.1783	.1698	1.050	22	40%
Control		.6291					
			Women				
Exper.	4	.495	−.265	.063	4.206	3	5%
Control		.760					
			Severe Stutterers				
Exper.	8	.4675	−.1138	.0886	1.284	7	30%
Control		.5813					

*As expressed in increases and decreases in length of heart beat. Units used in this table are twenty-fifths of a second.
**See footnote to Table I.

Regularity of Change in Heart Rate. The results from the study of regularity of change in heart beat length, as represented in the standard deviations of distributions of fifty heart beats, are given in Table X. The stutterers as a whole, the male stutterers, and the "severe" stutterers, did not show significant differences from their controls on this variable.

When the female stutterers were compared with their controls, the experimental group was found to have a definite tendency toward smaller standard deviations than their controls, their significance ratio ranking at the 5 per cent level. The inherent unreliability of estimates of population parameters derived from small samples does not encourage one's rejecting the null hypothesis with regard to female stutterers and their controls on this variable, on the strength of this evidence. Even so, the fact that these results are in substantial agreement with those of Palmer and Gillette (**10**) for their female subjects argues in favor of this conclusion.

It should be noted that the data from the present study represent the variability in heart rate *throughout* the respiratory cycle (including the pause), whereas Palmer and Gillette broke down their data into the beats occurring during inspiration and expiration and subjected each group to separate tests. They found that their male stutterers were more irregular than their controls on expiration, and less irregular than their controls during inspiration. It is conceivable, then, that a cancelling effect was responsible for the non-significant difference between the male groups in this study.

TABLE X. Regularity of Change in Heart Rate as Expressed in Mean Standard Deviation*

	N (Pairs)	Mean SD	Mean Diff.	SE Diff.	t**	d.f.	Signif. Level
			Combined Groups				
Exper.	27	.9511	−.2892	.1662	1.740	26	10%
Control		1.2403					
			Men				
Exper.	23	.9734	−.2536	.1937	1.309	22	30%
Control		1.2270					
			Women				
Exper.	4	.8297	−.4938	.1306	3.781	3	5%
Control		1.3235					
			Severe Stutterers				
Exper.	8	.7959	−.1405	.1458	.9636	7	40%
Control		.9364					

*The units in this table are twenty-fifths of a second; these units were used to express the changes in heart rate in terms of the changes in the period of the heart beat.

**See footnote to Table I.

Discussion of the Results of the Sinus Arrhythmia Study. It has been pointed out that Palmer and Gillette take the position that their results are of etiological import, whereas the present investigator prefers to interpret them in symptomatological terms. The following considerations seem to support the latter point of view: (1) the presence of more marked sinus arrhythmia in both stutterers and normal speakers during oral reading than during periods of silence before reading (Travis, Tuttle, and Cowan); (2) the observed relation between certain emotional disorders and sinus arrhythmia abnormalities (Bass) and the fact that deep breathing enhances sinus arrhythmia (Best and Taylor); and, (3), the significant negative correlation reported in this study

between sinus arrhythmia and heart rate. These considerations, because they indicate that sinus arrhythmia is some function of certain behavioral variables, relieve the experimenter from any compulsion to attribute such differences as may be found between stutterers and their controls to a physiological mechanism, except as such mechanism is conceived as consequence and not cause in the stuttering syndrome.

The fact that in both studies the female stutterers' data resembled those of the male stutterers and the male controls more than they did those of their own controls is not less subject to a symptomatological interpretation. Palmer and Gillette find in this cardiac masculinity of female stutterers evidence that stuttering is a sex-linked metabolic condition (**10**, p. 136). However, a glance at Table IX and X will reveal that the female stutterers' data in the present study resemble the "severe" stutterers' data even more than those for the male stutterers as a whole or those for the male controls.

Tentatively, the implications of these data for the present writer are as follows: that emotional consequences of being a stutterer cause a reduction in vagal tone which reduces the mean amount of change in heart rate and increases the regularity of change in heart rate; that the amount of these changes is a function of the degree of judged severity of stuttering in males; and that female stutterers, whatever the judged severity of their stuttering, tend to be more sensitive in this regard than male stutterers, possibly because the emotional consequences of stuttering are more marked in the female sex than in the male. However, further experimentation is certainly indicated by these data, particularly along the lines suggested by Hogewind (**4**) who reports evidence that stutterers as a group are sympathicotonic.

VI. Basal Metabolic Rate

Procedure. The basal metabolic rate tests were administered in the standard manner by Mrs. Muriel Ward, metabolism technician at the State University of Iowa Hospital. The 1941 model of the Benedict-Roth Metabolism Recording apparatus was used for all subjects. Automatic checks for most instrument errors are provided in this apparatus. The timing cylinder was checked regularly for accuracy by the attendant, and the soda lime was changed often enough to insure against errors from that source. The errors due to the patient were minimized through trial tests and are assumed to be randomly distributed over the two groups.

As many subjects as could arrange it were given a second test which was scheduled, when possible, for the day following the first test, but the time interval between the first test and the re-test actually ranged from a day to two months. The correlation coefficient for such data on twenty-four subjects was computed and the data for the first tests were analyzed for group differences with the *t*-test for related measures.

Results. Data were secured for twenty-four men and four women in the experimental group and an equal number of controls. The correlation between first and second tests for twenty-four subjects was .81. The correlation ratio in this case, because

the re-tests were administered in most instances more than a week after the initial test, is chiefly a measure of the physiological stability of the individual subjects, rather than of the reliability of the measurements made. The standard error of measurement (with the qualifications noted) derived from this correlation ratio was 3.94. These data indicate that the individual measures in this study are reasonably reliable. The errors in measurement have been discussed in the preceding section.

TABLE XI. Basal Metabolic Rate

	N (Pairs)	Mean Rate	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men and Women				
Exper.	28	−15.02	−1.34	1.93	.6943	27	50%
Control		−13.68					
			Men				
Exper.	24	−15.60	−3.14	2.01	1.57	23	20%
Control		−12.46					
			Women				
Exper.	4	−11.50	−9.5	2.77	3.43	3	5%
Control		−21.00					
			Severe Stutterers				
Exper.	7	−16.43	−9.1	3.31	2.75	6	5%
Control		−7.86					
			Controls				
Men	24	−12.46	−8.54	4.178	2.044	26	10%
Women	4	−21.00					
			Experimental				
Men	24	−15.60	−4.10	3.402	1.205	26	30%
Women	4	−11.50					

*See footnote to Table I.

Table XI includes the results of the analysis of the basal metabolic rate data. Differences between the men's groups and the combined groups did not prove to be significant. Differences with t's ranking at the 5 per cent level were obtained between the women stutterers and their controls, and between the "severe" stutterers and their controls. The women stutterers had a higher metabolic rate than their controls while the "severe" stutterers had a lower rate than their controls.

It is doubtful whether much significance should be attached to the results for the "severe" stutterers. Examination of the group means for the "severe" stutterers shows that whereas their mean rate (–16.43) is very close to the mean for all male stutterers (–15.60), the mean for their controls (–7.86) is much higher than that for all male controls (–12.46). These figures seem to argue caution in concluding anything about the metabolism of severe stutterers.

The results for the women's groups indicate that there is a real difference between the basal metabolic rates of female stutterers and non-stutterers of their sex. Furthermore, it is seen that whereas the female controls tend to have lower rates than the men controls, which is normal for sex groups of similar ages (**2**, p. 872), the female stutterers' mean rate is not appreciably different from that of the male stutterers. In fact, the female stutterers' mean rate in this study is higher than that of the male stutterers. The direction of this difference, however, because of the low significance level of its *t*, should be regarded as suggestive for further experimentation rather than as grounds for conclusions. The meaning of these results is confused by the fact that the lowest basal metabolic rate in the women's groups was reported for the only female judged to be a severe stutterer. Because of this contradiction and because of the small N's involved and the ambiguity of the basal metabolic rate datum (it is easily influenced by emotional excitement, fatigue, etc.) itself, interpretations must await on additional evidence.

VII. Blood Pressure

Procedure. Each subject was asked to go to the Student Health Department of the State University of Iowa immediately following the basal metabolic rate test. The blood pressure readings were then made by Dr. C. I. Miller, Student Health director, with a Baumanometer sphygmomanometer, with the subject seated. The subject was asked to return for a second reading after the second basal metabolic rate was taken. Seventeen subjects were able to return. The data were then analyzed as in the basal metabolic rate study.

Results. The raw score correlation coefficient for blood pressure readings for seventeen subjects, repeated after an interval of time ranging from one day to two months, was .81. Considering the instability of blood pressure itself, and the subjective errors of measurement inherent in the auscultatory method of measuring blood pressure, this correlation may be regarded as quite high, and as being indicative of satisfactory control of the conditions under which the readings were taken. This correlation, of course, is not a measure of the errors in measurement. Though the factor of operator errors contributes, physiological variations in the subject are probably a more important influence in depressing the coefficient from unity. As to the errors in measurement involved here, Shock and Ogden (**11**, 1939) found that the probable error of measurement of a single blood pressure

TABLE XII. Blood Pressure Data: Diastolic Pressure

	N (Pairs)	Mean	Mean Diff.	SE Mean	*t**	d.f.	Signif. Level
			Men and Women				
Exper.	23	72.91	−.91	2.71	.34	22	80%
Control		72.00					
			Men				
Exper.	19	73.05	−.89	3.019	.2948	18	80%
Control		72.16					
			Women				
Exper.	4	72.50	−1.00	7.00	.14	3	90%
Control		71.50					
			Severe Stutterers				
Exper.	7	74.85	−.44	5.30	.083	6	90%
Control		75.29					

*See footnote to Table I.

observation by the auscultatory method, when readings were made under conditions of rest, was 1.2 to 1.8 mm. for systolic pressure and 1.8 to 2.0 mm. for diastolic pressure.

TABLE XIII. Blood Pressure Data: Systolic Pressure

	N (Pairs)	Mean	Mean Diff.	SE Diff.	*t**	d.f.	Signif. Level
			Men and Women				
Exper.	23	110.00	−.17	2.828	.06	22	90%
Control		110.17					
			Men				
Exper.	19	109.58	−1.58	3.159	.5002	18	70%
Control		111.16					
			Women				
Exper.	4	112.00	−6.50	5.91	1.09	3	40%
Control		105.50					
			Severe Stutterers				
Exper.	7	112.57	−.86	7.21	.119	6	90%
Control		113.43					

*See footnote to Table I.

The results of comparisons of the experimental groups with the control groups on diastolic, systolic, and pulse pressure are presented in Tables XII, XIII, and XIV. No significant differences were found between the groups as a whole or between any of their various sub-divisions on any of the three measures of blood pressure. The women stutterers showed a tendency toward higher pulse pressure than the women controls, presenting a difference whose t ranked at the 10 per cent level.

TABLE XIV. Blood Pressure Data: Pulse Pressure

	N (Pairs)	Mean	Mean Diff.	SE Diff.	t*	d.f.	Signif. Level
			Men and Women				
Exper.	23	37.04	−1.09	2.826	.3857	22	80%
Control		38.14					
			Men				
Exper.	19	36.50	−2.5	3.32	.753	18	50%
Control		39.00					
			Women				
Exper.	4	39.50	+5.50	2.062	2.667	3	10%
Control		34.00					
			Severe Stutterers				
Exper.	7	37.71	−.43	6.63	.06	6	90%
Control		38.14					

*See footnote to Table I.

These data provide no grounds for rejection of the null hypothesis regarding the experimental variables. Though the possibility of a real difference for pulse pressure between female stutterers and non-stutterers might be entertained, especially in the light of evidence presented previously of possible cardiac and metabolic differences, the data invite further experimentation with larger samples more than they encourage positive conclusions.

VIII. Summary

The results of statistical analysis of data for heart rate, sinus arrhythmia, blood pressure, and basal metabolic rate obtained during silence under conditions of rest from twenty-nine young adult male and female stutterers, and an equal number of controls matched with the stutterers for age, sex, and body surface, may be summarized as follows:

1. No significant differences were found for heart rate. These results were not confirmatory of previous research.

2. A significant negative correlation was found between sinus arrhythmia and heart rate.

3. Qualitative analysis of sinus arrhythmia revealed no significant differences between stutterers and non-stutterers, though certain trends were noted which were in agreement with previous research findings.

4. Quantitative analysis of sinus arrhythmia revealed that the male stutterers were not significantly different from their controls, but that the female stutterers tended to have less marked sinus arrhythmia than their controls. These results were confirmatory of previous reasearch.

5. Male stutterers as a group were not significantly different from their controls on basal metabolic rate, but, whereas it is normal for female subjects in given age groups to have lower basal metabolic rates than males, female stutterers presented a higher mean rate than the male subjects in this experiment and presented a definite tendency to have higher basal metabolic rates as a group than their controls.

6. No significant differences were found on diastolic, systolic, and pulse pressure measurements. The female stutterers showed a tendency toward higher pulse pressure than their controls.

IX. Conclusions

1. Young adult male stutterers, as a group, are normal as regards heart rate, sinus arrhythmia, basal metabolic rate, and blood pressure when measures for these variables are obtained during silence under conditions of rest.

2. Female stutterers are likely to have less marked sinus arrhythmia than normal speakers of their sex.

3. Sinus arrhythmia and heart rate are concomitant variables.

4. Palmer and Gillette's studies of heart rate and sinus arrhythmia in stutterers and non-stutterers appear to have yielded significant differences (unlike the present study which found only "trends," a few of which resembled analogous data in their studies) chiefly because of their choice of the single heart beat and respiratory phase, rather than the individual subject, as their sampling units in their statistical tests.

5. Studies of the present type, involving variables which are known to be conditioned to some extent by the subject's experiences, are more enlightening as to the physiological consequences of being a stutterer than as to the etiology of stuttering. These physiological consequences tend to be most marked in the female stutterer (trends were found toward less sinus arrhythmia, higher basal metabolic rate and pulse pressure) and, tentatively, are to be attributed to the female's tendency toward greater emotionality than the male.

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A S C A
News and Announcements

ERNEST H. HENRIKSON, EDITOR
University of Denver

At the Chicago meeting it was voted to combine the offices of Treasurer and Secretary of the Association. Dr. D. W. Morris, who has served for the past two years as Secretary, is now the Secretary-Treasurer. In this capacity he serves also as Business Manager of the *Journal of Speech Disorders*, in accordance with a recently adopted constitutional provision. Formerly the Editor was the Business Manager of the *Journal*. The new arrangement will prevent duplication in bookkeeping, correspondence, etc., and will make for increased efficiency in the management of the Association's affairs. The Association has now grown sufficiently that its efficient management requires close co-ordination of the activities previously handled separately by the Treasurer, Secretary and Business Manager of the *Journal*. The Association is very fortunate to have in charge of these vital activities a man as able and conscientious as Dr. Morris.

With the consolidation of the offices of Treasurer and Secretary, Professor Bryng Bryngelson retired as Treasurer, and was elected to the office of President of the Association. Resolutions honoring Dr. Bryngelson as the retiring Treasurer, and honoring also the retiring President, Professor Samuel D. Robbins, were adopted at the Chicago meeting in December, 1942.

During the past two years the Committee on Education, under the Chairmanship of Dr. Martin F. Palmer, has made a very comprehensive survey and analysis of the academic status and character of speech correction in the colleges and universities of the United States. Over 1400 institutions were included in the investigation. On the basis of this study, Dr. Palmer, with the aid of his committee, drew up the revised classification of membership for the Association which was adopted and written into the constitution at the Chicago meeting. The Fellows present voted a resolution expressing gratitude to the Committee on Education, under the direction of Dr. Palmer, for the consistently constructive work they have done in raising the standards of the organization.

Careful attention is to be given to Dr. Palmer's article in the March issue of the *Journal*. It is designed to serve as a manual of instructions for anyone who desires to join the Association or to apply for a higher grade of membership than he now holds. The article is a significant document from the point of view of school administrators and clinical directors, for it defines clearly the standards which the Association has approved. Fellows of the Association are urged to obtain from Dr. Morris

a supply of the offprints, together with application blanks, in order that they may readily assist candidates who wish to apply for the various grades of membership.

Dr. Charles R. Strother has served for the past two years as Chairman of the Committee on Constitution Revision; in that capacity he has carried out a comprehensive study of the organizational needs of the speech correction profession and a corresponding evaluation and revision of the constitution of our Association. After careful study of the recommendations of Dr. Strother's committee, the Council recommended and the Fellows approved the adoption of the indicated constitutional revisions at the Chicago meeting, voting also a resolution expressing appreciation of the services rendered by Dr. Strother and his committee. The constitution, as revised, was printed in the March issue of the *Journal*. It should go far to raise standards in the speech correction field and to stimulate the expansion of effective and trustworthy speech correction services.

At the Chicago meeting last December action was taken to re-establish the Nomenclature Committee, with Professors G. Oscar Russell, Sara Stinchfield Hawk and Samuel D. Robbins (Chairman). Professor Russell was authorized to continue as Editor of the *Dictionary*, the preparation of which constitutes the major project of the committee. It is believed that the *Dictionary* will be published during the current year.

A number of elections to the ranks of Fellow, Professional Member and Clinical Member were announced at the Chicago meeting. (Elections of Honorary Life Fellows, Miss Pauline Camp and Miss Clara B. Stoddard, were announced in the March issue of the *Journal*.) In recognition of the members concerned, and for the information and interest of their friends and colleagues, the names are here listed:

Elected as Fellows: Ollie L. Backus, Mildred Freburg Berry, Eugene Hahn, Severina Nelson, Harold Westlake, and Ralph Raphael Sokolowsky.

Elected as Professional Members: Jeanette O. Anderson, Mabel-Louise Arey, Elizabeth Bosley, Adaline Bullen, Enod House, Mary Catherine Huber, Elvena Miller, Courtney D. Osborn, Miriam D. Pauls, Carl Henry Ritzman, S. Richard Silverman, Ida Whitten.

Elected as Clinical Members: John Garber Drushal, Thelma Knudson, Hazel DuCles Miller, Margaret Rowe, Doris G. Yoakam.

A number of applications were in process of review when this issue of the *Journal* went to press. As elections to the above grades of membership are processed they will be announced in subsequent issues of the *Journal*. The present classification of each member of the Association is indicated in the *Directory*. Members who regard themselves as eligible for a higher grade of membership than they now hold have the obligation of making

application accordingly. (See Dr. Palmer's article in the March issue.)

Dr. Edwin Burkett Twitmyer, a Fellow of the Association, died on March 3, 1943, after a short illness. He was widely regarded as an outstanding authority on corrective speech and child psychology.

Born September 14, 1873, Dr. Twitmyer received his Ph.B. at Lafayette in 1896; A.M., Lafayette, 1897; Ph.D., University of Pennsylvania, 1902 and Honorary L.L.D., Lafayette, 1933. He became Instructor in Psychology at the University of Pennsylvania in 1914. Dr. Twitmyer was a member of many student, faculty, athletic, civic, and scientific societies and activities. His breadth of interest and great humanity were characterized by high standards, scrupulous fairness, deep love of his fellow men and a reciprocated respect that has immortalized him with his friends, students and colleagues. He was a member of a great many scientific and scholarly societies, served on numerous committees, and was accorded many honors in the course of his illustrious career.

Dr. Twitmyer's greatest scientific activities were in the field of corrective speech. He founded the Clinic for Corrective Speech at the University of Pennsylvania in 1914 as one of the first university speech clinics in the world. He continued to be Chief of the Clinic for Corrective Speech throughout his life. He wrote a book on the correction of defective speech in 1932. In 1902 he published a thesis which in recent years has come to be recognized as a pioneer work in the field of conditioning. This report of research with humans coincided with those of Pavlov and Bechterev on animals.

The Provost of the University of Pennsylvania said of him, "He will be recorded as one of the greatest teachers in the history of the University, a man who was a liberal but who had firm standards." (*David J: Goodfriend.*)

During the year just passed the Association lost one of its loved and able Fellows in the untimely death of Professor Guy Shepard Greene. As Head of the Department of English and Speech at Iowa State College at Ames, Professor Greene found time in the midst of a very busy career to interest himself with rare sympathy and understanding in the problems of speech-handicapped students on the Ames campus. He conducted personally a very considerable speech correction service for these students, many of whom were immeasurably benefited, not only in their speech but also in their general personal development, by his kindly and intelligent efforts. He did much to further the humanitarian influence of speech correction in Iowa and throughout the wider region in which he was known and esteemed.

The following tribute was spread on the minutes of the Council at its Chicago meeting, December 29, 1942: "Resolved: The American Speech Correction Association expresses its appreciation of the contribution to speech education and speech correction made by the late Professor Guy Shepard Greene." (*Wendell Johnson.*)

A very significant development in the field of speech correction is the creation of a position of speech correctionist by the Crippled Children's Division of the University of Oregon Medical School. This position is being created "to supplement the medical and dental services now being given . . . under the care of the Crippled Children's Division." "[Other] duties will include consultation services for the Child Guidance Clinic of the University of Oregon Medical School, the Portland Public School System, the State Committee for Education of Handicapped Children and other agencies having a direct or cooperative relationship to the Crippled Children's Division." *Qualifications*

for the position are high and include Professional Membership in the American Speech Correction Association. Both from the viewpoint of the broad and extensive plan of the program and of the high standards set up for the position, this offers an example that other agencies might find it advantageous to follow. Moreover, it reflects the value of the Association's recent action in defining professional speech correction standards in terms of grades of membership in the Association.

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(*Continued on Page* 204)

WAR NOTES

HERBERT KOEPP-BAKER, EDITOR
Pennsylvania State College

At the 1942 Convention of the Association, Chicago, it was voted to continue the Committee on Civilian Defense. The problems which were to concern this Committee were those involving speech correction needs arising from congested conditions in defense areas, emotional reactions of children and adults to war conditions, pre-induction speech correction in high schools, colleges, and elsewhere. The Committee on Civilian Defense is made up of Professors James Bender, Harry Heltman, Wendell Johnson, George Kopp, John Snidecor, Ira Wile, with Professor Robert West as Chairman. (Dr. Snidecor is now serving with the National Research Council's Committee on Selection and Training of Communications Personnel.)

The Committee on Emergency Defense was also continued by action of the Association at Chicago, with its name changed to that of the Rehabilitation Committee. This committee is composed of Professors Harlan Bloomer, Bryng Bryngelson, Paul Moore, Mack Steer, Charles R. Strother, Harold Westlake, with Raymond Carhart as Chairman. (Professors Bloomer and Steer are now in service with the United States Navy.)

Members of the Association can very materially expedite the work of the Rehabilitation Committee and the Civilian Defense Committee by sending to the Association's Defense Co-ordinator, Dr. Herbert Koepp-Baker, any suggestions or requests which they may have and any information concerning possibilities for furthering the work of the Committees. The nature of this work, at least so far as the Rehabilitation Committee is concerned, is indicated by Dr. Carhart's report in the March issue of the *Journal.*

You are particularly urged to send to Dr. Koepp-Baker (a) the names of members of the Association serving in the armed forces, or filling government posts, (b) the names of stutterers and other speech defectives serving in the armed forces. In the case of each name submitted, please give the individual's rank and branch of service if he is in the military forces, or his position and agency or committee if he is serving in a non-military capacity. (If you yourself may be placed in either of these categories, please notify the Defense Co-ordinator.) In the Directory of the American Speech Correction Association, published in the March issue of the *Journal,* names of members serving in the armed forces were starred. This list will be brought up to date as the information requested above is received. Address Dr. Herbert Koepp-Baker, Speech Clinic, Pennsylvania State College, State College, Pennsylvania.

In this connection, it is worthy of special note that Dr. Steer, now in service with the United States Navy, served as Chairman of the original Defense Committee. It is appropriate here to recall a resolution passed at the Association's meeting in Detroit, in December, 1941:

> *Be it resolved,* that the Council of the American Speech Correction Association express its deep appreciation of the pioneering foresight and untiring efforts of Dr. Mack D. Steer in furthering the contributions of the Association to the national defense effort, and that the Association express its gratitude to the President of Purdue University for the co-operative support it is lending to the program of the Association through Dr. Steer.

At the 1942 Chicago Convention it was voted that "members of the ASCA who enter military service be exempt from dues for the duration of the war and that the Secretary-Treasurer be instructed to hold their *Journals* unless the members request otherwise."

If you know of any members in service who may not read this announcement, or whose present address may not be known to the Secretary-Treasurer, please communicate this information to them and urge them to write the Secretary-Treasurer.

The tragedy and horror of the war became especially evident and affecting when the Associated Press carried a few weeks ago the full story of the death of one of our members, Lt. James S. Maddox of Lafayette, Indiana:

> On the 77th morning there was a feeble commotion on the small raft adrift in the south Atlantic. Two merchant marine seamen and a naval gunner muttered a soft prayer and then the body of a man (the second within two weeks) was swallowed up by the sea.
>
> Lieut. James S. Maddox, of Lafayette, Ind., served on a United States merchantman. When the ship was sunk by a submarine Nov. 2, he and his gun crew leaped into the water. Lieutenant Maddox found himself on a raft with two Dutch seamen and an American, George Beazley of Hambelton, Mo. Two days after the torpedoing they picked up Gunner Basil D. Izzi, who had been clinging to a bundle of bamboo sticks.
>
> Then there began a fearful ordeal. Food ran out after 16 days. The men had to use their toes as shark bait to obtain some kind of nourishment, luring the dangerous fish into a noose and then dragging it aboard.
>
> Lieutenant Maddox had little to do but to think. His mind may have wandered back to Purdue, where he was an instructor in speech: 1937-41. Perhaps he recalled the days when he went to the University of Iowa, where he received his master's degree in speech pathology: 1937. Surely he thought a lot about his wife and family.
>
> Each day the men scanned the cruelly empty horizon. On the twentieth day they sighted a ship, but it passed them by. The following day another merchantman failed to notice their flares and flags. Life aboard the raft settled down to dull despair.
>
> On the 66th day, Beazley died. A few days afterwards, Lieutenant Maddox noticed that his vision began to fail him. He recognized Beazley's symptoms of death in himself and he must have known that his life was a matter of a few days. He looked for ships more carefully than before.

The floating piece of hell pursued its more or less aimless path as the men aboard prayed every night—in vain. One night Lieutenant Maddox . . . began to call for his wife. His voice rang monotonously through the lapping of the waves. The next morning found him dead.

Had he held out 6 more days, Lieutenant Maddox would have been rescued with the others who buried him at sea thousands of miles from his home.

Recently President Roosevelt signed Senate Bill 786 introduced by Senator Walsh and Senator Clark. This bill amends title I of Public Law Numbered 2, Seventy-third Congress, March 20, 1933, and the Veterans Regulations to provide for rehabilitation of disabled veterans, and for other purposes.

As a result of this legislation, all service-connected rehabilitation will be the responsibility of the Veterans Administration. The Rehabilitation Committee of the Association through its Co-ordinator is working out detailed plans to relate speech rehabilitation services to the total rehabilitation program that is to operate under this bill.

The Surgeon General's Office has authorized the Defense Co-ordinator of the Association to prepare recommendations for speech rehabilitation in the armed forces with General Hugh Morgan, Chief of Medicine. Colonel Roy D. Halloran, Chief of the Neuro-Psychiatric Division, has, in this connection, undertaken to study the actual needs for specialized speech services in the Mental Hygiene Units in the various Command Areas and in the Army Hospitals.

No relations have yet been established with the Air Surgeon Brigadier-General Grant, though this is contemplated.

An interesting experimental program of speech correction for the armed forces was conducted for a period of three weeks by Lieutenant Fred Darley and Lieutenant Caryl Spriestersbach, at Fort Riley during the spring of 1942. Both of these men received the M.A. degree from the University of Iowa. This service venture in military speech correction was carried out with the approval and with the interest of their commanding officer. They held the rank of Technical Sergeant at the time of the program. They report that though there was neither opportunity nor time for a systematic survey of the camp, a brief series of interviews with officers located and identified forty-four speech defectives. Of these, Lieutenants Darley and Spriestersbach selected twenty-two, eleven of whom were stutterers, and eleven foreign dialect and articulation cases. They treated these men for about two hours each day, working with them as a group for part of the time, and for part of the time in small sub-groups and individually.

Inasmuch as this program in speech correction was undertaken on the sole authority of their commanding officer and not authorized by Army Headquarters at that time, no official report of the project has been made through Army channels. It is important, however, to note that these officers report that in three weeks of concentrated work, they were able to accomplish a great deal with both the stutterers and articulation cases. Practically all of these men with speech defects were not only made keenly aware of the nature of their speech conditions but were also helped to understand that something practical could be done about their disabilities. The fact that two officers of the Army showed a positive interest in them and their speech problems greatly improved their adjustment to the conditions of army life. Lieutenants Darley and Spriestersbach have reported informally that the principal result of this program of treatment and consultation was that, almost without exception, these speech defectives were helped to achieve a more unemotional point of view which was reflected in the noticeable improvement in their relationships with other soldiers and in their attitude toward army duties. Most of them, moreover, learned to speak more distinctly and with less tension and anxiety. It is the opinion of these two speech correctionists, as a result of this experience, that speech correction can be carried out more effectively under most army conditions than under civilian conditions because of better motivation and relatively complete control over the men.

Members of ASCA will be interested in the following articles which were published in the April, 1943, issue of the *Quarterly Journal of Speech*, under the general heading of "The Nation at War":

The Status of Speech Defectives in Military Service, by Wendell Johnson
War Responsibilities of the Speech Correctionist, by Raymond Carhart
Speech Training of Army and Naval Officers, by Louis A. Mallory
Public Speaking in the Army Training Program, by McDonald W. Held and Colbert C. Held
Speech Curricula and Activities in Wartime, by Franklin H. Knower

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All members of the Association are reminded of the roster of speech correctionists being prepared by the Committee on Rehabilitation. Any member who is interested in doing speech rehabilitation work with men disabled in the war should get in touch immediately with Dr. Raymond Carhart, Chairman of the Committee on Rehabilitation, Speech Clinic, Northwestern University, Evanston, Illinois. Further information may be found in the "Report of the Committee on Emergency Defense" in the March issue of the *Journal*.

ABSTRACTS OF CURRENT ARTICLES

MARY HUBER, EDITOR
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At the annual meeting of the American Speech Correction Association at Chicago in December, 1942, great interest was expressed in the problem of speech rehabilitation of war injury cases. The editor of abstracts, who has already had some personal experience with these problems, has, in the choice of articles to review for the current issue of the *Journal*, placed considerable emphasis, therefore, on literature dealing with neurological speech problems, specifically those associated with war injury. Since the space is limited it may be well at this time to draw to the attention of the readers of the *Journal* the names of current periodicals which frequently contain articles of special interest to speech correctionists. The following periodicals are particularly helpful because of their excellent abstracting service: The *Quarterly Journal of Speech;* the *Child Development Abstracts*, issued by the Society for Research in Child Development, National Research Council, Washington, D. C.; *Psychological Abstracts; American Journal of Diseases of Children; The Nervous Child; Journal of Neurology and Psychiatry; Journal of Laryngology and Otology; Archives of Neurology and Psychiatry; War Medicine; Annals of Otology, Rhinology and Laryngology; and the Archives of Neurology and Psychiatry.* Two other abstracting services which are available to speech correctionists are: "Abstracts of European Literature on Speech and Voice Disorders of Soldiers in World War I" by Hide Shohara and Harlan Bloomer, University of Michigan, and "Speech Abstracts," edited and published by Clyde W. Dow, Massachusetts State College, Amherst, Mass.

Abbott, Walter D. (Lt. Commander, Medical Corps, U.S.N.R.), Due, Floyd O. (Lt., (j.g.), Medical Corps, U.S.N.R.), Nosik, William A. (Lt., (j.g.), Medical Corps, U.S.N.R.). Subdural hematoma and effusion as a result of blast injuries, *J. Amer. Med. Assoc.*, 1943, **121**, Nos. 9 and 10, 664-665 and 739-741.

Drs. Abbott, Due and Nosik report on ten patients suffering from subdural hematoma as a result of blast injuries. Included among the clinical findings are memory failure, perseveration, repetition of words and sounds, mild motor aphasia. *(Abstracted by Jeanette Anderson, Purdue.)*

Ackland, T. H. Treatment of head wounds at a forward operating center. *Australian and New Zealand J. of Surgery*, 1942, **11**, 230-234.

Of 2767 patients brought to this center for treatment approximately six hours after being wounded, 38 (1.4%) were suffering from head wounds; nineteen of these head-injured patients lived. From these figures, we may speculate on the number of a- or dysphasics who will require treatment that may include the services of the speech pathologist. *(Abstracted by Jeanette Anderson, Purdue.)*

Barach, Alvin L. The effect of low and high oxygen tensions on mental functioning, *J. of Aviation Medicine*, 1941, **12**, 30-38.

Dr. Barach, reporting on 25 normal subjects and 32 patients suffering from syndromes including anoxemia of one type or another, includes among his findings symptoms that are found in aphasias: mispronunciations, changed

perceptions of color and of the patients' own bodies, errors in retention and recall, reduced ability to form new and original associations. (*Abstracted by Jeanette Anderson, Purdue.*)

Bloom, Leon W. *A Study of the Increase in the Auditory Memory Span for Speech Sounds.* M. A. Thesis, Louisiana State University, 1941.

Purpose: To determine whether auditory memory span for vowel series can be increased by specific drill. *Subjects:* A class of 19 students in Speech Fundamentals, the experimental group, a class of 16 students in Speech Fundamentals, the control group. *Materials:* A phonograph record of an auditory memory span test composed of the vowels and diphthongs [aɪ], [eɪ], [u], [ov], [a], [ɔ], [i], [ɔ€]. *Procedure:* Over a period of seven weeks the experimental group was given sixteen lessons, of twenty to thirty minutes each, consisting of practice in the recognition of vowel series and of discussion of techniques of recognition. The control group was given no training. The test was administered to both groups before the beginning of the training period, at the end of four weeks and at the close of the training period. The test blanks were graded, and tabulations made of correct responses for each subject. *Conclusions:* 1. The auditory memory span is susceptible to significant increase. 2. This increase may be hastened by the use of specific drills over a period of time. (*Abstracted by Harriett R. Idol* in *Speech Abstracts*, 1943, Volume 3.)

Cama, Katayun H. Remedial work with speech defectives, *Indian J. of Psychol.*, 1942, **17**, Parts I and II, 25-34.

According to the author, the subject of speech pathology and speech rehabilitation has received very little attention in India. In this paper are outlined some of the more recent and important theories, therapies, and corrective procedures used in the United States. Certain cases in the Child Guidance Clinic of the Sir Dorabji Tata Graduate School of Social Work in Bombay, representing distinctive types of speech defectives, are given as illustrations of the procedures followed at this clinic. These cases are first given a thorough medical, neurological and psychological examination, and then treated according to the diagnostic findings by the appropriate services, being given psychiatric treatment and speech therapy where necessary. (*Abstracted by Mary Fry, Wisconsin.*)

Cobb, Stanley. Speech disorders and their treatment, *Bulletin of the New York Academy of Medicine*, 1942, **19**, 34-46.

A comprehensive analysis of the types of speech disorders with which speech pathologists, working in a neurological institute, are likely to be confronted. One by one each of the five levels of integration for speech in the central nervous system is taken up with regard to (a) common lesions, (b) clinical results of these lesions, and (c) treatment. It is suggested that there will be many cases of dysphasia among soldiers with head wounds and that specialists in this line are few and there is need now to train assistants and teachers to carry out the re-educational procedures. Treatment of aphasia is often not emphasized as much as it should be and re-education should be started when the first shock of the lesion or operation is over and the patient is comfortable.

In the treatment of stammering Professor Cobb emphasizes the importance of psychotherapy; without it he believes lessons in "elocution" and breathing exercises are more than likely to make the patient worse.

Crewdson, J. Speech in an imperfectly learnt foreign language (Cambridge Psychological Laboratory), *Brit. J. Psychol.*, General Section, 1941, **32**, Part I, 82-99.

An investigation was carried out with two French children of eleven and fourteen years, to study the ways in which speech is disturbed in a foreign language. The two girls, who were able to speak some English, read two series of prose passages in English, recalled one series in English and the other in French, and attempted in English and from memory to describe pictures shown to them. Records were made of what was actually said, of their general behavior and speech characteristics, and of their introspections.

Certain types of breakdown were found in speech under these conditions which resemble defects found in aphasia. The chief of these were: (a) tendencies to word simplification; a symptom of semantic aphasia; (b) tendencies for difficulties in the material to be expressed to be reflected in the articulatory processes: the aphasic can often pronounce and articulate correctly only in simple circumstances; (c) tendencies to revert to a more primitive mode of speech reaction; in this case literal translation and dropping of the [h] were primitive modes of reaction; (d) tendencies to avoid abstract features of the material, and inability to express ideas of temporal and spatial relationship.

It was thought that the investigation might suggest further lines of work which might be of importance to the study of aphasia, of the learning of foreign languages and of language generally. (*Abstracted by Mary Fry, Wisconsin.*)

Jeghers, Harold. The appearance of the tongue as an index of nutritional deficiency, *The New England J. of Medicine*, 1942, **227**, 221-227.

It is suggested that the tongue is probably a better indicator of somatic disturbances than any other part of the oral mucosa; this is especially true for various nutritional deficiencies. Changes in taste or in movement and the onset of paralysis or tremors are of value in neurologic diagnosis. A brief but excellent review of the anatomy of the tongue is given along with the lingual manifestations of systemic disorders, as well as the primary lingual manifestations produced by nutritional deficiencies.

The tongue is enlarged in cretinism, myxedema, mongolism, acromegaly, angioneurotic edema, infectious glossitis, etc. It appears that one may expect to see dryness of the tongue in deficient vitamin states as well as in dehydration. Nicotinic acid has been reported as a successful remedy for chronic dry mouth. A unilateral coating of the tongue may be noted when half the tongue is immobilized by paralysis. A correlation of coated tongue with gastric ascidity has been found.

Grooved or fissured tongue is a congenital anomaly present in about 0.5% of the tongues of the human race irrespective of age, is commoner in men, and often inherited through the male sex. Investigators have found hyperchlorhydria to be not uncommon in such persons.

The appearance of the vast majority of tongues can be described as falling into one of the following categories: normal tongue, coated tongue, grooved (scrotal) tongue—with a coat, with macroglossia, with wandering rash or with atrophy; pellagrous glossitis, riboflavin deficiency glossitis (magenta tongue); atrophic glossitis—with complete smoothing, slight general smoothing or marginal smoothing; black (brown) hairy tongue, with salivation or dryness, with ulcerations or fissures, with microglossia or macroglossia.

Nielsen, J. M. and Friedman, Arnold P. Fundamental principles in aphasia based on autopsy material of crucial cases, *Bulletin of the Los Angeles Neurological Society*, 1942, **7**, 77-87.

Among their own cases, gathered over a number of years, the authors find ones which are crucial experiments that settle controversial points of long standing and add some decisive material concerning certain general principles of aphasia. From the cases cited the authors state that the following conclusions can safely be drawn: 1. The minor cerebral hemisphere assumes the function of the major in language with great facility in some instances, with difficulty in others, and not at all in some persons. 2. The language function, if partly destroyed, does not usually transfer to the minor side in toto; the visual, auditory, or motor functions may be transferred separately. 3. The major temporal lobe and the major occipital lobe may not be ipsilaterally located. 4. The putamina have no function in language (this statement does not apply to the external capsules). 5. An artificial writing mechanism may be formed on the minor side by training; when this happens the entire speech mechanism does not of necessity move to the minor side. 6. It is unsafe to lateralize a lesion on the basis of an aphasic manifestation alone.

Salomon, Elsie. Speech disorders and their treatment, *South African Medical J.*, 1942, **16**, 215-218.

An outline of the general procedures used at the Transvaal Memorial Hospital for Children in Johannesburg for the correction of stammering, cleft palate and hare lip, the speech of the deaf, the speech of the laryngectomized, retarded speech, the guttural [r], speech defects due to paralyses, speech jargon, paralysis of the soft palate, and lisps, which latter term the author uses to cover all those defective sounds due to misplacement of one or other of the speech organs. Some illustrative case histories are also given. The stammerer is encouraged to concentrate on seeing and feeling the organic formation of words by forming words without sound. In the correction of defective sounds or lisps the child is taught the correct positions using only sight and touch without hearing. The movements only are practiced until such time as the lisper can instantaneously place the speech organs in the correct position when asked to say the sound. (*Abstracted by Mary Fry, Wisconsin.*)

(*Note:* The following three reviews have been selected from "Abstracts of European Literature on Speech and Voice Disorders of Soldiers in World War I," by Hide Shohara and Harlan Bloomer, University of Michigan.)

Barth, Ernest. Rueckblick auf die Kriegsaphonien, *Archiv fur Laryngologie u. Rhinologie*, 1920, Bd. **33**, 536-560.

The author questions the validity of the electric treatment so generally and frequently used as a therapeutic measure for aphonic cases resulting from war. He recommends the phonetic treatment as most successful. The method consists in awakening the central association necessary for phonation, e.g. to bring up the respiratory movements of the thorax, phonative movements of the vocal tube which can be influenced by the will of the patient and can be guided by the therapist thus arousing association active in normal phonation.

Only in the case of failure of this method, the author turned to the use of cocaine and mild endolaryngeal faradization.

The above phonetic method cured 90-95% of 250 cases in one group, three-fourths of them in one sitting. The use of various other methods, including the use of narcosis, hypnosis, pretended operation in severe cases in which the phonetic method failed, did not succeed. (*Abstracted by Hide Shohara and Harlan Bloomer, Michigan.*)

Donath, J. Kriegsbeobachtungen ueber hysterische Stimm-, Sprach- und Hoerstoerungen, *Monatschr. f. Psychiatrie u. Neurologie*, 1916, Bd. **40**, 301-317.

Donath attributes the enormous number of hysterical voice, speech and hearing cases in war to strong explosive power of modern arms, and not to the average inferior nervous system of soldiers. Finest organic lesions are hard to be defined from purely functional disorders, but the rapid and sudden recovery, whether spontaneous or suggestive, is infallible proof for the functional nature of the disorder. In the case of sudden deafness that may come through fracture of the skull and simultaneous bleeding, lumbar puncture will lift the pressure and bring recovery. The treatment of hysterical hearing, voice and speech disorders, since they are rooted in psyche, is psychotherapy. The method, however should be suited to individual needs and should not be stereotyped. (*Abstracted by Hide Shohara and Harlan Bloomer, Michigan.*)

Rothe, K. Die Stoische Philosophie als Mittel psychiatrischer Beeinflussung Stotterer, *Zeitschr. f. d. ges. Neurol. u. Psych.*, 1917, Bd. **36**.

The author discusses the therapy of stutterers, particularly of war stutterers, by philosophical studies, especially by the study of Stoic philosophy. The Stoic philosophy distracts the attention of the patient from himself as a stuttering being and induces him to conquer pain, embarrassment, anger, and so on, through self control and knowledge of human nature, i.e. by will and reason. The success is brought about both by the weakening of the injurious influence and by positive effects. (*Abstracted by Hide Shohara and Harlan Bloomer, Michigan.*)

BOOK REVIEWS

CHARLES VAN RIPER, EDITOR
Western Michigan College

JOHN WYLLIE. The Disorders of Speech. Edinburgh: Oliver and Boyd, 1894. Pp. viii + 495.

The publication date of this text on speech disorders may require an explanation. Until now, the *Journal of Speech Disorders* has confined its reviews to new books exclusively. However, this book, now almost forty years old, has had so profound an influence on medical attitudes toward speech defects and their treatment that every speech correctionist should read or reread it.

Wyllie's book is divided into three parts. The first includes a discussion of stammering and voice disorders; the second concerns itself with articulatory defects and the development of speech in the normal and subnormal child; the third is a treatise on speech disturbances as symptoms of nervous disease.

The Disorders of Speech is written without jargon. Wyllie seems to be so honestly trying to make sense out of the things he sees and hears in his cases that the reader finds himself scrutinizing his own pet dogmas with discomfiture. Even when we disagree with the author we admire his powers of observation and description. Every chapter has several suggestions for research or speculation. The freshness of the book is in itself a prime reason for its reading. But let a few quotations tempt you:

"The trilling motion of the tongue (in the production of a trilled R) is not effected by the middle of the tip, but, in most individuals, by the tip at the right side of the middle line. Is this an indication that the speech energies are not distributed with absolute equality to the two sides of the tongue, but that the tongue in speech is to some extent "right handed"? It would be interesting to find out, by further observation, if left handed people trill with the left side of the tongue tip."

A definition of cluttering: "A torrent of half-articulated words, following each other like peas running out of a spout."

"Far more perfect speech can be obtained by the employment of suitable obturators and vela than has ever been obtained from surgical operation."

"There are few more melancholy chapters in the history of surgery than that which gives an account of the operations on stutterers."

"On careful experiment, I find that of the whole eleven consonants which the tip of the tongue normally takes part in the formation of, viz., j, th, s, z, sh, zh, t, d, n, l, r, I can pronounce all, except n, when the tip of the tongue is held fixed behind the arch of the lower teeth; the dorsum of the tongue being employed instead of the tip." He goes on to mention a patient who spoke well with only a stump of tongue remaining.

"He had stammered in the usual manner up to the age of 15, but at that period of life he began to make great efforts to overcome his impediment and found that, when in difficulties he could always pronounce the word by having recourse to the 'draw-back' method of phonation (inhalation). Practicing this method voluntarily at first, he soon found that it became involuntary and habitual with him."

"It must be remembered that many patients (stutterers), especially those who are intelligent and persevering, do not require the aid of a tutor or specialist. If they can be made to understand thoroughly the nature of their defect, they can, themselves, by dint of persevering and intelligent practice, break their old vicious habits of speech and acquire the new habit of speaking in a normal way."

Wyllie invented a workable phonetic alphabet, insisted upon the classification of [y] and [w] as glides, classified the consonants according to difficulty of teaching, rejected time-beat and breathing exercises for stutterers, distinguished between primary and secondary stuttering, worked out an articulation test with the sounds in initial, medial and final positions, showed the manner of functioning of the false vocal cords in defective speech. Indeed, he anticipated so many of our modern techniques of diagnosis and therapy

that this reviewer cannot help but be thankful that it was this book rather than any other which became the standard reference for several generations of physicians. It can still serve as an interesting reference for the present generation of speech correctionists.

C.V.R.

VAN DUSEN, C. Raymond. Training the Speaking Voice. New York: McGraw-Hill, 1943. Pp. x + 232.

The contents of this book are divided into eight main parts entitled: Introduction, Cultivating a Guide, Making Physical Preparation for Vocal Activity, Producing the Voice, Caring for the Voice, Correcting Voice Defects, Appendices, and Index. Distributed among the six main divisions are twenty-three chapters with titles descriptive of the contents. Fifty-nine of the 232 pages provide practice material, nineteen pages carry seven division titles or are blank, the Appendices use thirteen pages and ten pages are used for the index. The book is printed on good quality paper with easily read type face. The pages are attractively laid out and provide clear distinction between main and subordinate headings. The cover is grey with blue trim and the book seems to be well constructed.

Perhaps the first criterion to apply to a textbook is: Does this book supply a need? The number of texts in the field of voice improvement is inadequate in proportion to the general need for voice improvement. During the rest of this review, five more basic criteria will be applied to this book.

Criterion 1. Are the points of view and the explanations of them scientifically sound? Many of the statements about voice and voice production generally accepted as statements of fact are merely hypotheses. Since the reviewer has presented hypotheses about voice and voice production which are in conflict with some generally accepted by teachers of speech and since the text presents some points of view which conflict with hypotheses presented by the reviewer, the answer to this question is hard to formulate.

Seemingly, the most valid criterion of whether the conflict in these hypotheses discredit the scientific reliability of the text is: Does the hypothesis presented aid the student in the use of insight? The reviewer believes that the text directs attention to articulatory acts, i.e., opening and using the resonators, whereas, the attention of the student should be directed to the phonatory act. However, it seems only fair to say that in directing voice improvement, the suggestions of the teacher seem to be more important than are hypotheses set forth in a text.

The term "vacuum" seems misused in the sentence, "The activity of the muscles of the back and chest cause a vacuum to be created in the chest cavity, and the air rushes in to fill the space " (p. 26). Obviously the expansion of the chest cavity cannot do more than decrease the air pressure within the respiratory tract. And on the next page the author in discussing developing control over breathing mentions "breathy" voices and suggests that "the voice can be improved by the development of control over breathing" (p. 27). The attention in this instance should be directed to the way in which the glottis is controlled.

Criterion 2. Is sufficient information presented to enable the student to use insight in mastering his problem? Adverse criticism arising under this criterion has been given in the preceding section and a few more instances will be noted later. On the whole, the reviewer is inclined to answer this question with a soft affirmative.

Criterion 3. Are the learning procedures practical? The single chapter entitled "Training the Ear" in Section 2 makes a very important contribution to voice improvement technique, and the reviewer believes the material on relaxation likewise will be very helpful. Moreover, an attack on the relaxation problem provides time during which the ear training can be carried on.

In discussing "avoiding throatiness" in Chapter 13, the suggestion that the student "should try to feel the tones in the head, in the cheekbones . . ." may be misleading. Here the resonation hypothesis does not seem to supply

the remedy. Likewise in a succeeding section on amplifying the tone emphasis is placed on control of resonators rather than on the manner in which the voice is produced.

Two very helpful suggestions are given in Chapter 14, "Varying the Voice." One of these involves a technique for practicing variation in pitch by following indicated pitch changes as one counts from one to eight. The other suggestion concerns a similar technique for practicing variation in loudness. Moreover, the two techniques can be combined to give simultaneous variation in both pitch and loudness.

In Chapter 15, "Projecting the Voice," the hypothesis conflict is again present although some very good suggestions are given, and in Section V the chapter entitled "Caring for the Voice" introduces some helpful ideas which have been ignored in other texts.

In the last section, among suggestions for correcting defects of quality, pitch, intensity, and rate, the conflict of hypotheses arises again in the section on quality in the statement: "The *thin*, in which the higher overtones are prominent and there is a lack of resonance." If there is a lack of resonance how could there be a predominance of higher overtones? Nevertheless, the suggestions given about these deviations are generally helpful. The reviewer prefers to classify rate with the process of articulation, yet it must be given consideration in a book on voice improvement.

Criterion 4. Is the language adapted to the intended reader? The reviewer believes that the language used is well adapted to the intended reader, although the presence of explanatory footnotes indicates that clarity has not always been achieved in the text proper.

Criterion 5. Does the text provide motivation for attacking the problem of voice improvement and carrying out the suggested therapeutic procedures? The text seems to be very good in this respect.

The reviewer believes that *Training the Voice for Speech* will be a valuable contribution to the speech field by making its users more aware of good voice and the procedures by which one's vocal habits can be improved.

F. LINCOLN HOLMES

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Memo—The September issue of the *Journal of Speech Disorders*, honoring the memory of the late Dr. Max Goldstein, will be devoted to articles dealing with general education for the deaf and hard of hearing, speech reading, hearing aids, speech correction, audiometry, types and causes of hearing deficiency and other basic and practical problems. Distinguished contributors have pooled their knowledge and experience to make this a publication to be treasured by all who are interested in the deaf and hard of hearing. Address special orders for the Goldstein Memorial Issue, or full subscriptions, to Dr. D. W. Morris, Indiana State Teachers College, Terre Haute, Indiana. (See tear-sheet at back of this issue.)

SELECTED BIBLIOGRAPHY FROM CURRENT BOOKS AND PERIODICALS ON SPEECH DISORDERS IN TIME OF WAR

Undertaken at the request of the Education Committee of the American Speech Correction Association by a Bibliography Committee:

SARA STINCHFIELD HAWK, Ph.D. (Chairman), EMIL FROESCHELS, M.D., MARGARET HALL, Ph.D. and PAUL PFAFF, Ph.D.

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